Session 5

Regional Cooperation in Asia relating to Space Activities

REGIONAL COOPERATION IN ASIA RELATING TO SPACE ACTIVITIES - NORTHEAST ASIAN ISSUES -

by

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Introduction

Despite the cause of international cooperation, Northeast Asian countries have not as yet tapped much from the wisdom in cooperative space activities developed else where. China and Japan have rather respectively been active in organizing separate programs based on the data acquired through their own separate space activities. South Korea is still gearing up to become an independent space power, jammed in between the two competing giants. North Korean missile and nuclear tests have aggravated tension in the region, which has in turn hampered international cooperation. The tension over the Korean peninsula, which originated from the conflicts of the power politics, has resulted by-products of poor cooperation not only in security and space activities but also human rights, environment, and other possible common goods that could be achieved through regional economic integration. The purpose of this paper is to suggest to tackle the problem of poor cooperation in space activities, by re-examining the nature of the competitive political environment, and by building up a normative overarching framework, as has been successfully applied in the Helsinki process in Europe.

I. Limited Cooperation in Space Activities in Northeast Asia

1. Aspects of International Cooperation in the Region

Through international cooperation, participants in the space activities can receive benefits out of abridging costs and increasing synergy effects. International cooperation is also vitally important in times of a disaster or an accident. It works also significantly in preserving environment and human rights. Win-win effects that states would benefit out of international cooperation will eventually build up bases for international peace and security, which is vitally need in the Northeast Asia, where the remnants of the Cold War still haunt.

That is why the Outer Space Treaty provided international cooperation twice in the preamble, and articulated its significance in five articles thereafter. The major concern is that "the exploration and use of outer space ... shall be carried out for the benefit and interest of all countries," and that States shall facilitate and encourage international cooperation in [scientific] investigation," "in accordance with international law, including the Charter of the United Nations, in the interest of maintaining international peace and security and promoting international cooperation and understanding."

International cooperation is one of the basic norms of international law. The UN General Assembly designated it as one of the seven basic principles which would require progressive development and codification in the Declaration on Principles of International Law

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Concerning Friendly Relations and Cooperation Among States in Accordance with the Charter of the United Nations in 1970. It emphatically stated the duty of states to cooperate with one another in accordance with the Charter, wherein it had already designated international cooperation as one of the four purposes of the United Nations to be achieved "in solving international problems of an economic, social, cultural, or humanitarian character, and in promoting and encouraging respect for human rights and for fundamental freedom for all." Indeed it is not only a designated purposes to be achieved, but also means to get there. It is indeed an overarching norm, in that "States have the duty to cooperate with one another, irrespective of the differences in their political, economic and social systems, in the various spheres of international relations, in order to maintain international peace and security and to promote international economic stability and progress, the general welfare of nations and international cooperation free from discrimination based on such differences."

Unlike Europe, where European Space Agency (ESA) has shown vivid examples of international cooperation, Northeast Asian countries have as yet shown scanty examples in such minor areas as in exchange of information at scholarly meetings and through courtesy visits. Cold War remnants still persist in Northeast Asia, particularly over the divided Korean peninsula. Under the 1953 armistice, the two Koreas are still legally at war, supported still by the U.S. and her allies on the one hand, and China on the other. Japan has aligned with the U.S. in security matters since its defeat in the World War II. The mounting regional tension, coupled with the traditional China and Japan rivalry, has hampered any possibilities for regional cooperation in space activities.

2. China's Strategy

Since China's first successful launch of a satellite in 1970, its space projects have been conducted under the direction of Commission of Science, Technology, and Industry for National Defence (COSTIND). Its space activities have aimed at protecting its national interests and at implementing its development strategy. Since China successfully launched a manned satellite in 2003, it has been regarded as the third space power in the world. China has shown its ambition to explore the moon by launching a satellite encircling the moon in 2007, and by sending a non-manned satellite there in 2012.

China has emphasized upon the significance of international cooperation again, upon ushering into the new millenium. The White Paper on China's Space Activities issued in November 2000 persistently supported international cooperative activities in addition to its development strategy, maintaining that "international space cooperation should be promoted and strengthened on the basis of equality and mutual benefit, mutual complementarity and common development." It reiterated the guiding principles enunciated in the annex of the United Nation's Declaration on International Cooperation on Exploring and Utilizing Outer Space for the Benefits and Interests of All Countries, Especially in Consideration of Developing Countries' Demands in 1996. Mostly in line with the principles enunciated therein, China announced its policies in developing international space cooperation, persisting in independence and self-reliance policy, and attaching significance to the Asia-Pacific regional cooperation.

In 1992 China along with Pakistan and Thailand proposed an establishment of the Asia-Pacific Multilateral Cooperation in space Technology and Application (AP-MCSTA). The three countries sponsored a workshop in Beijing in November that year on that theme. Sixteen Asia-

Pacific countries including the three other entities discussed possibilities for promoting international cooperation in the region. China emphasized upon the significance of promoting international cooperation in space technology and its application in Asia-Pacific region, and establishing the Asia-Pacific Space Cooperation Organization (APSCO) in the future. China also signed a Memorandum of Understanding on Cooperation in Small Multi-Mission Satellite and Related Activities in 1998 in Thailand along with the hosting Thailand, Iran, South Korea, Mongolia, Pakistan. China's previous emphasis upon the significance in regional cooperation in the 2000 White Book diluted away in its 2006 White Book, expanding its interests in international cooperation into the global arena. The APSCO, started as a symbol of Chinese initiated regional cooperation in space activities, has now nine member countries including Turkey and Peru.

3. Japan's Action

Japan launched its first satellite in February 1970. Two months later China did the same. The two have competed fiercely thereafter, just like the Soviet Union and the U.S. have done since early 1958 when the latter hurriedly followed the former's path of the successful launch of the first satellite Sputnik several months earlier. In twenty some years, Japan has been counted as one of the major space powers, by successfully launching series of satellites. China has in turn strongly challenged Japan particularly since November 1999 by launching four space ships by 2002. On October 15, 2003, China proudly launched its first manned space ship Shenzhou (Devine Craft) in October 2003. Unfortunately, however, Japan's attempt at launching a space ship by H2A Rocket No. 6 proved to be a failure in November of the same year. More than a year's recuperation, Japan became eventually successful in launching one in February 2005. However, China was successful in another manned launch on October 12, 2005. Hurt by the Chinese successful launch of the manned space ships, Japan pronounced her plan to challenge a lunar exploration by a robot in five years, and to construct a manned space base on the moon by 2025. However, China soon forestalled the Japanese dream again by announcing a plan to send a non-manned space ship to the moon by 2010, and a manned one by 2017.

For an effective competition with China, with the self-reliant space policy under the aegis of national defence, currently Japanese space community is mulling over possible revision of Japanese space policy, ascribing such retardation to the self-imposed clause of the "exclusively peaceful purposes" regarding the use of space technology provided in the Japanese Diet Resolution in 1969. Apparently they prefer a system wherein the national defence authorities can have a say in investment and operation of the space industry. Recently a Special Committee on Space Development and a group of the members of the Liberal Democratic Party has prepared a bill on the Basic Law on Space Activities, but it has been stalled due to the disagreement with the members of the New Komeito Party, a wing of the coalition. The contents of the proposed bill apparently reflect the nationalistic spirit of the increasing right-wingers, who were successful in promoting the National Defence Agency to the Ministry of Defence in 2006. Japan has recently established a spy satellite network by successfully launching the fourth spy satellite on February 26, 2007. A global network with the four spy satellites equipped with one meter high resolution cameras will cover the whole globe for twenty four hours a day.

II. Reasons for Limited Cooperation

1. Geo-Political Conflicts

One of the deepest concerns looming in the Northeast Asia is the tension in the divided Korean peninsula. Since the Korean War, China has been a staunch ally of North Korea. The armistice still persists in the Korean peninsula, where nearly two million soldiers confront each other equipped with nuclear weapons. The U.S. and Japan have been on the alert particularly since North Korea launched Daipodong ballistic missile over its territory to the direction of the U.S. on August 31, 1998. In spite of the North Korean remark on opposition to all forms of terrorism, deploring at the 9/11 terror incidents in New York and Washington D.C., President Bush soon labelled North Korea as one of the 'axis of evil' suspicious of proliferating weapons of mass destruction (WMD). The U.S. has also suspected China as a possible origin of the proliferation of the WMD and the delivery system, since the reception of the information with respect to the Pakistan/North Korea trade of nuclear materials and missile technology.

Japan has also been disappointed at the news that China had been involved in the Pakistan-North Korea trades in nuclear and missile technology, and has stayed aloof from Chinese program of international cooperative space activities with developing countries such as AP-MCSTA and APSCO, maintaining close steps with the U.S. in security matters in the region. South Korea as an ally of the U.S. has also taken a similar posture, while emphasizing upon significance of the 'sunshine policy' toward North Korea.

2. Missile Technology Control Regime (MCTR)

Since weapons of mass destruction (WMD) playloads require platforms to deliver them to their intended targets, it is significant to watch the potential delivery platforms of certain complete rocket systems, which include cruise and ballistic missiles, space launch vehicles, and sounding rockets, in addition to piloted and unmanned air vehicle systems, which include cruise missiles, drones, unmanned aircrafts, and remotely piloted vehicles. Particularly cruise and ballistic missiles equipped with WMD can present acute threats to countries within the range of the target. One of the means by which to inhibit the proliferation of such delivery system would be through the rigorous application of export controls targeting the key technologies for the production.

The Missile Technology Control Regime(MTCR), formed informally 1987 by Canada, France, Italy, Germany, Japan, the United Kingdom and the United States, by now expanded to include as many as thirty-four countries including Russia, Bulgaria, South Korea, etc. do excercise substantial control over international transfers of medium-range missiles and the related technology. Membership of the MCTR is not inclusive. Although China, which had been treated as informal and partial adherent since 1991, reportedly expressed its intention to join the MTCR in June 2004. The MTCR officials responded that it would give positive consideration, but China has not yet become a partner. Presumably it is because certain members have still been suspicious of the Chinese relationship with Pakistan, which were thought to be potential candidate of the proliferation of nuclear and missile capabilities.

As stated above, the major aim of the MTCR is to restrict the proliferation of the potential WMD delivery systems of the ballistic missiles, unmanned air vehicles, and related technology for the systems capable of carrying a 500 kilogram payload at least 300 kilometers.

Unfortunately, however, the Regime's controls include space launch vehicle as a part of the complete rocket system. The MTCR is not an international organization. It does not make export licensing decisions as a group. It voluntarily adheres common export policy guidelines adopted as an integral common list of control items listed in the MCTR Equipment, Software and Technology Annex. Countries are encouraged to follow the guidelines even without joining the group. It has also conducted outreach activities to non-partner countries, providing them with practical assistance regarding export controls, related legislation, and enforcement.

The MTCR Guidelines make it clear that the Regime is "not designed to impede national space programs or international cooperation in such programs as long as such programs could not contribute to delivery systems for weapons of mass destruction." However, partner countries are to be careful about possible transfers of any space launch vehicle equipment and technology, since the technology used in a space launch vehicle is virtually identical to that used in a ballistic missile system.

South Korea concluded a contract with China in 2001 regarding a launch of a multipurpose satellite, but it became abortive in 2002, because the U.S. showed a stern posture that it would no longer supply any parts of satellites in the future if South Korea abides by it, stating that such technology could be transferred to a country with proliferation potentiality via China, which is not a partner of the MCTR. The cooperative mood developed between China and South Korea has thus been scrapped by the U.S. export control, allegedly in line with the policy guidelines of the Regime. South Korea had to conclude a new launch contract with Russia a partner of the MCTR in 2003. Thus, Korean satellite *Arirang-2* was launched into orbit successfully aboard a Eurockot launcher at Plesetsk Cosmodrome on July 28, 2006 in Russia. *Arirang-2*, equipped with one meter multi-spectral high resolution camera. South Korea is currently planning to launch a satellite at its newly established Oenarodo Space Center in 2008, assisted by Russia.

III. Current Efforts to Increase Cooperation and the Limits

1. China-Japan Rivalry

Since early 1990s, China and Japan have entered into fierce competition in international politics with respect to space activities. In 1992 China initiated Asia-Pacific Multilateral Cooperation in Space Technology and Applications (AP-MCSTA) along with Pakistan and Thailand. Its mandate has been known "to facilitate programs of multilateral space cooperation in the Asia-Pacific region and [to] promote the institutionalization of AP-MCSTA." In 1993, Japan also initiated Asia-Pacific Regional Space Agency Forum (APRSAF) stating that such a forum would help enhance mutual development of program by exchange views toward the cooperation in space activities in the region.

After a decade long preparation, China established the Secretariat of the AP-MCSTA in Beijing in July 2001, they prepared a text of the Convention of the Asia-Pacific Space Cooperation Organization (APSCO). China initiated the first meeting of the Interim Council to formulate APSCO in Beijing on October 29, 2005. Five new members of Bangladesh, Indonesia, Iran, Mongolia and Peru signed the Convention along with the three original members of the AP-MCSTA. Turkey joined it in 2006. China was mulling over a possible initiation to launch a small multi-mission satellite program in 2007 by adding up South Korea as a partner, but the latter dropped back for fear of a warning from the U.S. that China is not a member of the MCTR.

The Asia-Pacific Regional Space Agency Forum(APRSAF) that Japan initiated 1993 was in response to the declaration adopted at the Asia-Pacific International Space Year Conference (APIC) in 1992, to enhance the development of each participating country's space program as well as to exchange views toward the cooperation in space activities in the region. While the Chinese AP-MCSTA sought to initiate the APSCO as an international organization, the APRSAF has remained as an umbrella forum, inviting many space agencies, private space entities, and universities mostly in the region including some in other regions. As a forum, it could invite government officers of certain countries, and regional and international organizations European Space Agency (ESA), and most of the national space agencies such as National Aeronautics and Space Administration (NASA), Canadian Space Agency (CSA), Russian Space Agency (FSA), Chinese National Space Administration (CNSA), etc. By March 2007, it has developed into a global forum, including as many as ninety-eight entities from twenty-six countries and twelve international or regional organizations are participating.

Under the umbrella forum, Japan has also shown leadership in setting up a Disaster Management System. Its first step has been to set up 'Sentinel Asia.' The first step is to garner "voluntary and best-efforts-basis initiatives" in order to share disaster information in the Asia-Pacific region on the Digital Asia (Web-GIS) platform, and to make the timely use of earth observation satellites data for disaster management in the region. It is basically an internet-based, information distribution network to distribute relevant satellite and in-situ spatial information on multiple hazards in the region. It will eventually draw on satellite derived products and imagery from all available earth observing geostationary, or low-earth orbiting satellites, such as meteorological satellites that provide routine data. The system is to be used by member countries to acquire through participating and cooperating space agencies during disasters like flood and tsunami. Currently twenty-three countries are participating in the disaster management support system.

2. South Korean Attitudes

South Korea is planning to become an independent space power by launching a satellite at the newly constructed Oenarodo Space Center by 2008, even if she is not yet free from the limitation of trajectory to 500 kg with the distance of 300 km. As a late starter with a shoe-string budget, she looks far smaller compared to the two rivaling space powers of China and Japan. Despite the frustration at the scrapping of the launch contract with China in 2001, due to the U.S. warning not to supply any parts and technology of future satellites following the terms of the MTCR, South Korea has actively participated in the AP-MCSTA conferences.

Korea Aero-Space Research Institue (KARI) hosted the third meeting of the AP-MCSTA in 1996, as well as the ninth annual meeting of the APRSAT in 2003. China has made serious efforts to persuade South Korea to join the APSCO, but the latter has not yet dare to do so for the obvious reason that her participation may trigger a suspicion to the U.S. that she would not follow the guidelines of the MCTR faithfully by collaborating with China, a non-MCTR member. As far as South Korea cannot become independent of parts and technology of satellites, it would be risky to join the APSCO, where members are required to do certain action jointly for theme of the international organization.

South Korea has rather been active in participating fora, wether it be AP-MCTA or APRSAT. KARI participate has thus participated actively in the Sentinel Asia as a part of the Disaster Management Scheme of the APRSAF collaborating with the Joint Project Team(JPT).

JAXA and KARI have built up friendly relationship by concluding a memorandum of understanding in June 2006. KARI is also seriously considering concluding a memorandum of understanding with the Chinese CASC.

3. Cooperation with ASEAN

China and Japan has rarely cooperated in regional or international space activities. Instead, each of them has made separate efforts in extending cooperative hands to developing countries in Southeast and other Asia-Pacific regions. Chinese efforts to recruit members of the APSCO among ASEAN have still been limited to Thailand and Indonesia, which have been collaborating with her since its initiation of the AP-MCSTA in 1992. It has so far been successful in recruiting six members from other regions: Bangladesh and Pakistan are from Southwest Asia; Iran and Turkey are from the Near East; Mongolia is from the Central Asia, whereas Peru is across the Pacific. Without independent space capabilities, they need Chinese contribution with regard to various space applications such as remote sensing and telecommunication.

The APRSAF under Japanese leadership has developed to a remarkable extent as a forum for discussion and sharing data and information for building up networks like Asia Sentinel to tackle the possible disasters in the region. It is marvelous that the ninety-eight entities from the twenty-six countries are sharing information, along with twelve international or regional organizations, including ASEAN. All of the ASEAN countries have joined. Notably eight entities from China including CNSA are also collaborating in sharing information and data. Such a success would be probably due to the common cause of the participant to tackle the natural disaster like tsunami and flood.

IV. Possibilities for the Promotion of Cooperation

1. Assessing Possibilities

Would it be possible for Northeast Asian countries to learn seminary examples of international cooperation from other regions, such as Europe? What are the obstacles to overcome to imitate a mechanism for an international cooperation in space activities as fostered in Europe? European countries have been successful in garnering the wisdom of cooperation, based on the commonalities in culture and religion soaked in the region since the Roman Empire. The European Union has just marked its fiftieth anniversary of its creation as European Economic Community by the Treaty of Rome in 1957, turning their backs of the tragic war, and voluntarily pooling parts of their sovereignty into a supranational European organization. Its evolution has continued until the membership has expanded to twenty-seven, based on its fundamental notion of openness to trade, people, and new countries. The Organization for Security and Cooperation in Europe (OSCE), created on August 1, 1975 in Helsinki, basically as a multilateral forum involving all European countries and the U.S. and Canada, also based on the respect of common values of openness rooted in the Western civilization, has now evolved into a semi-global organization, including countries in the Central Asian and else where. Unfortunately, such notions as openness, reconciliation for mutual prosperity have yet been far lacking in the Northeast Asia, where the inertia of tradition still persists.

Apparently the Chinese leadership in the APSCO under the banner of international cooperation still imbued with the time-honored notion of hierarchy that China should lead small

and medium size developing countries. The Chinese leadership retaining the traditional style would face difficulties in intermingling with the rest of the world in the era when the Cold War has virtually been over. China has developed too much to be a leader of the third world, particularly in the field of space activities. The APSCO has already developed into a semi-global international organization reigning in the Asia and the Pacific.

2. MTCR and China

China's non-partnership at the MTCR in turn hampers the future of the APSCO. It is remarkable that Turkey could join the APSCO in 2006 despite her membership at the MCTR. It has been a good contrast with the case of South Korea, who could not dare to join the APSCO in fear of a possible sanction from the U.S., because her role therein would be a partnership with China in building up a regional cooperative body for space activities. Presumably the U.S. and other leading members of the MTCR was not that noisy over Turkey's application for the membership at the APSCO, because her role therein would be rather limited to receiving data from China.

The MCTR is still a supplier's cartel with non-inclusive membership. The main theme of the Regime is non-proliferation of the missile and space technology. It is not an international organization. It may not have universal mandate except non-proliferation. The doors are closed to those developing countries which clamour for a help in learning space technology. Probably the APSCO would be one of the doors through which the developing countries would like to knock and peep in to find a chance to learn space technology.

The key factor that hampers possibilities for regional cooperation in the Northeast Asia is the MTCR. The inherent problem therein is that there is no bright line between the technology used in military missiles and that used in civilian space launch vehicles has frustrated international cooperation between a country with that technology and another without one. It can be used as a political leverage to control a developing country without such technology. It could also work as another type of leverage controlling a country not to purchase technology from an unfavorable country like China, which has been looked suspicious of certain linkage with countries of WMD proliferation potential.

Differences between space launch vehicles and ballistic missiles include trajectory, rocket size, propulsion, guidance, and payload, let alone launch facilities and infrastructures. However, the U.S. has held the view that ballistic missile technologies are essential to all aspects of space activities. The U.S. with such a strict view has limited the scope of its international cooperation in space activities, and selectively denied some states's access to its space launch technologies. Such policy has been articulated in the U.S. laws, having extraterritorial effects. Notably, National Defense Authorization Act in 1994 included the so called 'sense of Congress' clause that "[m]issile technology is indistinguishable from and interchangeable with space launch vehicle technology." By stipulating this significant clause the U.S. Congress made it clear that it could oppose to all emerging national space launch vehicle programs.

The U.S. policy on the MTCR and the related laws are too strict to be in line with the Guidelines of the MCTR, which provides that the MTCR is "not designed to impede national space program." It is also against the basic principle of the 1967 Outer Space Treaty, which in fact recognized the dual-use nature of space technology, permitting the use of military

equipment in space and on celestial bodies for peaceful purposes in line with the principle of "open and non-discriminatory access to space." Dual use potentials alone cannot justify the selective denial of access to technology which would be vitally needed to countries, particularly those which are willing to provide end-use assurances.

The MTCR, as "set of identical policies to be implemented in parallel" does not represent international norms. The potential danger built in the nebulous dual nature of the MTCR should not derogate the basic tenet of the Outer Space Treaty. The strict arbitrary implementation of the MCTR in the domestic laws may lead to restrictive access to outer space, which is of course against the basic tenet of the Outer Space Treaty, resulting in a *de facto* appropriation of the outer space. It may trigger international responsibility, in that it violates the basic tenet of the Outer Space Treaty, which has already become a customary international law. It is also contradictory to the U.S. affirmation in 1967 that "outer space ... [is] not open just to big powers or the first arrivals but shall be available to all, both now and in the future."

Indeed, the MTCR has been one of the most stringent barrier to the possible aquisition of outer space capabilities by emerging outer-space potential states. One commentator said that the MTCR has, over time, "acquired the goal of preventing developing countries from gaining access to space through independent space-launch programmes." The MCTR has been detrimental to the development of the space program in developing countries particularly because of the strict application even undermining certain lenient portions of the MCTR Guidelines. The U.S. export control laws implementing the MCTR have been applied selectively in order to promote U.S. national security and foreign policy objectives, and consequently have discriminated against countries which are not favored. This kind of discriminatory nature of its application coupled with its exclusiveness inherent in the MTCR may result in aggravating regional tension and in heightening resentment.

Basically the MTCR is a kind of supplier cartel. The policy adopted in that type of cartel cannot become international law. It cannot be used to derogate the basic tenet of the Outer Space Treaty in spite of the deterrent role in restricting proliferation of the delivery system of WMD. It would be desirable for the world community to discuss the problematic hazy dividing line of the dual use issues, and seek after possibilities for providing concrete norms in the arena of international law. Probably one desirable way to crystallize a norm is to request the World Court to deliver an advisory opinion by the UN General Assembly initiated by some injured countries the arbitrary application of the problematic domestic law in international affairs.

The MTCR, in spite of its effects in contributing to non-proliferation of the delivery system of the ballistic missile, has rather worked in frustrating international cooperation in space activities, particularly in the Northeast Asia, as has been apparent in cancelling the 2001 launch contract between China and South Korea. The latter has had to restrain herself in participating in the APSCO despite the repeated invitation of the group. The MTCR has been notorious since its creation in 1987 due to its effects of non-dissemination of space technology toward developing countries. Quite a few commentators stated that the U.S. policy has been discriminatory, citing instances of such discrimination exercised mainly towards the unfavorable states. This means that the MTCR has thus virtually worked toward derogating the basic tenet of free access or non-discrimination, stipulated in Article 1 of the 1967 Outer Space Treaty.

3. Necessity for an Overarching Norm

It is remarkable that China has played a leading role in the six-party talks dealing with the North Korean nuclear issues, since the 1994 Agreed Framework broke down due to President Bush's remark on 'axis of evil' in his State of Union Address in 2002, and the ensuing the North Korean withdrawal from the NPT in January 2003. By dint of China's active role as chair-country in the series of six-party talks in Beijing for three years, the parties arrived at Agreement on a Joint Statement on September 19, 2005. In it, North Korea agreed to return to the NPT along with a commitment to abandon all nuclear weapons and the related program in return for the economic cooperation and aid with energy in addition to the planned construction of the two turn-key style light-water nuclear reactors. It was unfortunate that North Korea conducted a nuclear test on October 9, 2006 in retaliation against the delay of the release of her frozen assets in Banco Delta Asia in Macau. The six parties resumed talks and reiterated their previous commitment on February 13, 2007.

Notably, the Joint Statement on September 2005 included a significant clause that "the directly related parties [to the Korean War] will negotiate a permanent peace regime on the Korean Peninsula at an appropriate forum." This was reiterated in the Joint Statement of February 13, 2007. Presumably 'the direct parties' refer to the two Koreas, China and the U.S. The mandate of the separate forum is to change the current armistice system of the Korean War (1950-53) into a peace regime by concluding a peace treaty, which should be concluded by all parties fought during the Korean War, namely, the two Koreas, China, the sixteen allied powers dispatched under the Security Council Resolution, including the U.S.

Along the line of this possible regional framework for security and peace, the U.S. Congress stated that the "U.S. should explore the possibility of a regional human rights dialogue with North Korea that is modelled after the Helsinki process, engaging all countries in the region in a common commitment to respect human rights and fundamental freedom." Just as the Helsinki process was an overarching norm building framework, comprising human rights, security and environmental issues, it would be desirable that a future peace framework in Northeast Asia dealing with the pending issues of Korean peninsula should also comprise of such broad issues as one relating to cooperation in space activities in the region.

The remaining two parties, namely Japan and Russia are not directly related to the Korean War. Japan had nothing to do with the War, except that it sold non-contraband goods to Korea, whereas Russia actively supported North Korea financially and materially. That was the reason that the then Soviet Union actively participated in the Geneva Conference in 1954 as one of the twenty parties the Soviet Union also participated as an interested party in addition to the nineteen parties recommended by the armistice agreement, even if it was not a party to the Korean war. In the recent six party talks, Russia as a successor of the former Soviet Union has participated along with Japan, even if not directly related to the Korean war. They were added as they were conceived as indirectly affected parties to the North Korean nuclear issues. Their participation will boost up a spirit of multilateralism, whereby an eventually agreed framework may be better implemented as a part of regional security framework.

4. Prospects for Regional Cooperation

A possible reconciliation between China and the MTCR over her application for a partnership would set a cornerstone in building up a cooperative environment in the Northeast Asia. Under such an environment, South Korea could tap expertise from her neighbor China. When South Korea become an independent space power either with her own technology or otherwise, she would be in a better position to play a role as a balancer in coordinating between the two neighboring space giants. South Korea has already acquired capability of retrieving remote sensing data almost as high level as her neighbors by launching satellite Arirang II equipped with one meter high resolution camera on July 28, 2006. She could soon share such data along with her neighboring space giants as well as Southeast Asian countries without any political interests.

It is remarkable that the Japanese led APRSAT has contributed much in establishing Sentinel Asia as a part of the Disaster Management Scheme, in that each participant, whether it be a state agency, or a private entity like a university or a research institute, can tap the common data to contribute to the common good of safety. The character providing informal fora has been the wisdom of the leadership. It has so far been successful in inviting as many as ninety-eight domestic agencies in the twenty-six countries, twelve international and regional organizations including ASEAN, UNESCAP and UNOOSA. It is notable that the Chinese National Space Agency (SNSA), China Remote Sensing Satellite Ground Station, and other six entities have recently participated.

Conclusion

Northeast Asia is a unique region in the world where there still persists remnants of the Cold War, as is evident in the armistice system in the divided Korean peninsula, and the pending security issues over the North Korean nuclear test. Due to the political tension coupled with the inertia of the tradition, possibilities for regional cooperation in space activities have been frustrated.

One of the most acute problems that hampers regional cooperation is the U.S. influence as represented in the MTCR, a supplier's cartel, as was evidenced in the ill-fate of the 2001 launch contract between China and Korea the next year. The mandate of the MTCR to the effect that it should block symptoms of any factors related to the proliferation of WMD has incurred conflicts with the principles of international cooperation and free access. The nebulous concept of the possibilities for dual use of the space technology as missiles should be defined by a world organization such as the UN General Assembly or at the International Court of Justice possibly through a process for an advisory opinion. The MTCR should clarify its guidelines by setting up objective standards, so that such nebulous clauses like 'catch all' phrase should no longer be used in hampering regional or international cooperation in space activities. by virtually blocking the possible trade in parts of satellite system and the related technology. It would be desirable that China's application to join the group should be approved soon, once she shows sufficient evidence that she has carried out requirements of the MTCR. Chinese partnership therein will be a catalyst in building up a cooperative environment for space activities in the Northeast Asia.

A possible resolution of the nuclear issues on North Korea will pave the way not only toward building up a permanent peace system in the Korean peninsula, but also toward a

permanent security and peace in the region. An overarching framework, modelled after the Helsinki Accords in Europe, would help build up peace and prosperity system in the Northeast Asia. It should include broad norms of reconciliation and common prosperity, comprising areas such as human rights, environment and security let alone regional cooperation in space activities. Such a framework coupled with a possible reconciliation between the policies of China and the MTCR will eventually help set up an environment which will foster regional and international cooperative activities, paving a way toward a regional space organization as elsewhere.

REGIONAL COOPERATION IN ASIA RELATING TO SPACE ACTIVITIES (COMMENTARY)

By

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I. Introduction

"Rising Asia" is the phrase often used to portray the international geopolitical landscape today. The rise of China and India to the global power is especially emphasized in many reports along with the rapid economic growth in the Southeastern Asian nations. One example would be the report of the US National Intelligence Council, *Global Trends 2015,*[1] which points out that China and India are well positioned to become global technology leaders due, in part, to the fact that both countries are investing heavily in basic research in high technology.[2] Indeed, the rapid high-tech developments would constitute the key to the wealth of nations in the 21st century, and the aggregates of the most advanced and refined of the systems of high technologies would be the space technology. That is one of the main reasons that many ambitious countries are pursuing advanced space science and technology. Space accomplishments would bring not only national prestige, but also technological edge which can be translated into hard currencies; and national prestige itself is still important to inspire and integrate nationals in case of emerging global powers.

While Asia as a region is rapidly growing in the global economies, it is at the same time true that many Asian countries are still in the developing stage and hard-pressed to provide their nationals with safer, better and more affluent life standards. Many Asian nations also face geographical difficulties to construct basic socio-economic infrastructures, which would be resolved by space applications such as satellite telecommunications, distance learning and tele-medecine systems. Accordingly, it can be said that not only the development, but also the use, of space technology is highly required in this region, since space applications could instantly bring the benefits to local people.

Increasing number of Asian nations have been actively involved in space applications. The stage of only being a beneficiary of data from foreign remote sensing satellites has ended as more nations started manufacturing, owning, and operating national satellites for the earth observation. While it is much more difficult to develop independent launching vehicles, operating national satellites are within the reach of many nations, primarily because of the successful introduction of the less expensive high-quality micro satellites for earth observation.[3] Making the most of the limited resources for space development and utilization, it is well

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[1] US National Intelligence Council (NIC), *Mapping the Global Future: Report of the National Intelligence Council's 2020 Project* (December 2004). http://www.foia.cia.gov/2020/2020.pdf (date accessed: 30 June 2006).

[2] *Ibid.*, pp 11-12.

[3] Although there exists no agreed upon definition of small satellites, those manufactured for less than about 20 million US dollars with the weight of less than 500kg are often referred to as such by experts. A more detailed classification indicates that satellites between 500-100 kg are called "MiniSat" while those around 50 kg "MicroSat", and 10kg, "NanoSat." One estimate says that already more than 170 small satellites of less than 300 kg have been launched. See, e.g., Shinichi Nakasuka, "Small Satellites: Present and Future" (in Japanese), Katsuyuki Kawai.ed., *Treatise on National Space Strategy* (Seibundo, 2006) pp. 176-218.

recognized and understood in the Asian region that the international cooperation, on the global as well as regional scale, shall be seriously pursued. It is true that a certain difficulty arises since the space technology can not be developed without the inherent military implications, but it should not be insurmountable, taking into consideration of the European precedents in this regard. More than three decades have already passed since the European Space Agency (ESA) became the center of European space activities.[4] European space cooperation has even developed in the pursuit of common space policy between ESA and European Commission (EC), as documented by "Towards the European Space Policy", published in December 2001. In addition to the current mandate of basic research as well as exploration and use of outer space, ESA is also positioned in this document as an executive agency for implementing space activities decided by the European Union (EU). Galileo system-program is one good example of EU and ESA integrated space activities.

Although not comparable to the European close and organized space cooperation, Latin American countries have also the possibility for the close cooperation. In contrast, since Asian countries are so diverse in peoples, religions, languages, cultures, political systems and degree of economic growth, the basic foundation for cooperation is very fragile, if not non-existent. Thus, it is necessary to develop carefully the buds of cooperation into blossom, and prevent the complicated political ramification and rivalry from stepping into the cooperation. The creation of a win-win situation is essential to bring the robust and sustainable regional space cooperation. In order to study the ways and measures to promote regional space cooperation, this paper would clarify at first the present situation of the regional space development. Then, possible, realistic and desirable mechanisms for regional space cooperation would be considered in order to enhance the regional prosperity and security.

Before beginning with the analysis, the scope of Asia as a region would be defined. The term "Asia" would cover northeastern and southeastern parts of Asia, or "ASEAN + 3"[5] plus Mongolia, People's Republic of Democratic Korea (PRDK or North Korea) and Taiwan as well as South Asia such as India, Pakistan, and Sri Lanka. On the other hand, countries such as Iran and Iraq are excluded from the Asian nations while they are sometimes included in the Asia as the western part thereof. Also excluded is Russia although some parts of Russia are being geographically regarded as Asia.

[4] Convention for the Establishment of a European Space Agency (ESA Convention) was signed in 1975 by all member states of the European Space Research Organization (ESRO), of the European Organization for the Development and Construction of Space Vehicle Launchers (ELDO) and of the European Space Conference. Although the Convention entered into force in 1980, ESA has been functioning *de facto* since 1975 in accordance with Resolution No.1 of the Conference of Plenipotentiaries that had approved the text of the ESA Convention. As of August 2006, 17 nations belong to the ESA not including associate members of Canada, Czech Republic and Hungary.

[5] Association of South East Asian Nations (ASEAN) was first established in 1967 by Indonesia, Malaysia, Philippines, Singapore and Thailand. Brunei became a party in 1984 and the members accepted after post Cold-War are Cambodia, Laos, Myanmar and Vietnam. "ASEAN +3" consists of "ASEAN 10" nations plus China, Japan and Republic of Korea (South Korea).

II. Asian Space Today

A. Three categories of development stages

Development of space science, technology and application in Asia could be categorized in three stages: first category includes nations such as China, India, and Japan that possess fully independent space capabilities. These three countries own national launching vehicles to put domestic satellites into the geostationary orbits (GEO) and manufacture various kinds of satellites using fairly advanced technologies. All three countries are state parties to the four of the five UN treaties on outer space: Outer Space Treaty (1967),[6] Rescue Convention (1968),[7] the Liability Convention (1972)[8] and the Registration Convention (1975).[9]

Second category of Asian nations consists of states which have been pursuing either manufacturing, owning, or operating national remote sensing satellites or launch vehicles. Korea and the several of ASEAN nations are in this category. Third category refers to states which are the passive beneficiaries of space applications. Although several countries remained in the third category, yet the increasing number of Asian countries are in the transitional phase from the third to a second category.

B. First Category: China, India and Japan

In February 1970, Japan became the fourth country to place a national satellite into an earth orbit by its own rocket; China is the fifth (April, 1970) and India seventh in the world (1980).[10] It was in 1977 that Japan first successfully launched a national satellite into a GEO by N-I rocket, as, again, the fourth country to do so, which was followed by China and India in 1984 and 2001 respectively.[11] Three nations have been operating a variety of national satellites, including telecommunication, broadcasting, remote sensing, navigation, intelligence gathering, and data-relay. Japan has been third in number of satellites launched up until now[12], while India launched the second largest number of civilian remote sensing satellites in the world only after the US,[13] and China launched 47 satellites of various types with a flight success rate of over 90 percent.[14] China successfully conducted manned space flights in 2003 (1 astronaut, Shenzhou V)

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[6] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (entered into force on 10 October 1967) 610 U.N.T.S.205.

[7] Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (entered into force on 3 December 1968) 672 U.N.T.S.119.

[8] Convention on International Liability for Damage Caused by Space Objects (entered into force on 1 September 1972) 961U.N.T.S.187.

[9] Convention on Registration of Objects Launched into Outer Space (entered into force on 15 September 1976) 1023 U.N.T.S.15.

[10] UK is the 6th country in this category and the only nation where the launching facility does not exist in its own territory.

[11] 13 GSO satellites (INSAT series) India owned by that time, were launched by foreign vehicles.

[12] See, e.g., http://www.unoosa.org/en/Reports/docsjapan.html. (date accessed: 28 September 2006). http://www.unoosa.org/en/Reports/docsfra.html (date accessed: 28 September 2006).

[13] First remote sensing satellite was launched in 1977, the first among the three nations. Currently, India operates IRS-1B, IRS-1C, IRS-P3, IRS-1D, OCEANSAT-1, RESOURCESAT-1, and CARTSAT-1. http://www.isro.programmes.htm (date accessed: 6 September 2006).

[14] State Council of China, *China's Space Activities, a White Paper* (2001), p. 11. English translation of this White Paper is found, *e.g.,* http://www.spaceref.com/china/china.white.paper.nov.22.2000.html (date accessed: 1 July 2006).

and 2005 (2 astronauts, Shenzhou VI) as the third nation in the world. Chinese Space White Paper published in November 2000 [15] had expressed its determination to send Chinese astronauts into outer space by 2010. That White Paper also made it clear that China would embark on the extensive manned moon exploration after 2020.[16] In reality, manned space program turned out to be more advanced than a reserved announcement in the White Paper. China's Second White paper on Space Activities, or *China's Space Activities in 2006*, published in 12 October 2006, records its breakthroughs in developing basic technologies for the lunar exploration within the 5 years[17] India (Chandrayaan) and Japan (Selene) are also to launch an unmanned space probe for the lunar exploration in around 2007.[18]

An example of the advancement of space science would be Japan's asteroid exploration vehicle, Hayabusa, which successfully collected the sands of near Earth asteroid Itokawa in November 2005 as the world's first exploration of such category.

C. Second Category: Korea, Indonesia, Malaysia, and Thailand

Increasing number of the countries of Asia belonging to the second category includes countries like Korea, Indonesia, Malaysia, and Thailand. Singapore and Taiwan could be added to this list. Nations in this category operate multiple telecommunications and broadcasting satellites as well as own or at least develop remote sensing satellites. As an example of the robust space programs in the second category nations, space activities of Korea, Thailand, Indonesia, and Malaysia would be briefly discussed below along with the succinct reference to some other countries. Among the second category nations, Korea and Indonesia are parties to the four UN treaties on outer space while Thailand is party to the three UN Treaties. Malaysia is not a party to any one of the UN space related treaties.

1. Korea

Korea is rapidly approaching the first category, developing its own rocket and constructing a launching facility in its territory. The first Korean launching site, situated in the South-western part of Korea, at North Latitude of 34.26 degree and East Longitude of 127.3 degree, is to be completed in 2008.[19] One of the characteristics of Korea's space activities is that it started rather recently. The Korean space program started after the Korea Aerospace Research Institute (KARI) was established in 1989. Basic Long-term Space Development Program of Korea of 1996 revealed its plan to own 20 satellites by 2015, manufacture independent national launching vehicles, and construct a launching range. As for the launching vehicles, Korea Space Launch Vehicle (KSLV) is being pursued through the cooperation with Russia; first KSLV, which would put a satellite into LEO, is planned to be launched in around 2007.

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[15] *Ibid.*

[16] *Ibid.*

[17] State Council of China, *China's Space Activities in 2006*. English translation is found in http://english.people.com.cn/200610/12/eng20061012_311157.html (date accessed: 12 October 2006).

[18] As a member of International Space Station (ISS) under construction, Japan does not have an independent manned space program.

[19] Seven satellites procured by Korea until 2000 have been launched from outside its territory. It would be the 13th nation to have a launching range in its own territory. A longtime US-Korea agreement which prevented Korea from developing a missile with a range of more than 180 km was annulled in 1998 after the extensive bilateral negotiation, thus enabling Korea owning a civil rocket to put a satellite into earth orbits.

Korea's first satellite, KITSAT-1, developed through the cooperation between SatReC[20] and Surrey Satellite Technology Limited (SSTL)[21] was launched by Ariane rocket in 1992. KITSAT-2 was launched in 1993 by a US launch vehicle,[22] and KITSAT-3, in 1999, put into an orbit by Indian PSLV-C2.[23] Along with KITSAT small satellites, Korea has also launched medium to large telecommunications satellites, KOREASATs (Mugungwha) and remote sensing satellites, KOMPSATs (Arirang). While the first KOMPSAT (with a spatial resolution of 6.6 meter), launched in 1999[24], was manufactured in cooperation with the US, the second KOMPSAT (having resolution of 1 meter), launched in July 2006, is evaluated as almost completely national-made.[25] The third KOMPSAT is planned to be launched in 2009. The first KOREASAT was launched in 1995, second, in 1996, third, in 1999[26], and the fourth, named as KOREASAT-5[27] was successfully launched in August of 2006 as the first dual-use satellite for both the military as well as the civilian communications purposes. [28]

SatRec Initiative (SatRec-I), a venture set up in 2000 by former SatReC engineers, represents a promising example of providing rapid and cost-effective small remote sensing satellites in the Asian markets, where Korean space industry has found a good opportunity to promote its space commercialization. SatRec-I has been manufacturing a small remote sensing satellite, Razaksat, with Malaysia. In addition, two Korean candidates are being trained in Russia to be the first Korean astronauts in the International Space Station (ISS) in 2008.[29] Korea is one of the six nations in this region which are parties to the four of the UN treaties on outer space, along with China, India, Indonesia, Japan and Mongolia.

2. Thailand

Space activities in Thailand started in early 1970's and in 1982 the national data receiving station began to gather Landsat data. One of the most outstanding characteristics of its space activities is that Thailand has been receiving extensive remotely-sensed satellite data since the early 1980's. As of today, Geo-Informatics and Space Technology Development Agency, or GISTDA, under the Ministry of Science and Technology (MOST) of Thailand, receives data of NOAA, MODIS[30], Landsat, SPOT 2, 4 and 5, Radarsat, IRS-1C/1D and IKONOS. In the Southeast Asia, no country has been receiving remote sensing data from as many satellites as Thailand.[31] Thailand

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[20] Satellite Technology Research Center (SatRec), established in 1989, is located within the Korea Advanced Institute of Science and Technology (KAISAT).

[21] SSTL is a leading research and development company of small satellites working with the Surrey Space Centre at the University of Surrey's engineering research group.

[22] Information of KITSAT 1 and 2 are in ST/SG/SER.E/297 (16 January 1995).

[23] ST/SG/SER.E/358 (29 June 1999).

[24] ST/SG/SER.E/368 (27 January 2000).

[25] Information on KOREASAT 1 and 2 are in ST/SG/SER.E/304 (19 March 1996).

[26] ST/SG/SER.E/362 (8 October 1999).Information on that launching was furnished to the UN within a month after the launching.

[27] KOREASAT-4 does not exist since the figure 4 implies unlucky in the eastern Asian countries.

[28] See, e.g., http://space.skyrocket.de/doc_sdat/koreasat-5.htm (date accessed: 27 August 2006).

[29] Another three persons are candidates for space tourism.

[30] The Moderate Resolution Imaging Spectroradiometer (MODIS) is a 36-channel from visible to thermal-infrared sensor that was launched as part of the Earth Observing System (EOS) Terra payload on 18 December 1999. It collects data at 250m/500m and 1km resolutions.

[31] Singapore receives satellite data from NOAA, MODIS, SPOT and IKONOS, while Malaysia does

had received data from Japan's MOS-1 and JERS-1 between 1986 and 2002 and would receive data from ALOS satellite launched in January, 2006 as soon as it would be available.

As for the space development program of Thailand, GISTDA is responsible for earth observation while the Ministry of Information and Communication Technology (ICT) is involved with the "authorization and continuing supervision" (pursuant to Article VI of the Outer Space Treaty) of satellite telecommunications, as telecommunication affairs have been operated by a private corporation, Shin Satellite Public Company Limited, founded in 1991. Shin Satellite, a subsidiary of Shin Corporation PLC., was granted a 30-year Build-Transfer-Operate concession (which would expire in 2021) from the Ministry of Transport and Communications to operate the national satellite system.[32] Shin Satellite is providing its telecommunication services to Cambodia and Laos in addition to its domestic markets[33], operating five satellites, or Thaicom-1A (launched in 1993), Thaicom-2 (1994), Thaicom-3 (1997), iPStar-1 (or Thaicom-4) (2005), and Thaicom-5 (2006). All the five Thai communication satellites have been launched by the Ariane rockets. Thaicom 3 and 5 have been designed by the European companies, and the Thaicom 1, 2, and iPStar by the US companies.[34] World's biggest satellite, iPStar of 6505 kg is dedicated exclusively for broadband services in 14 nations in the Asia-Pacific region.[35]

Thailand has also developed earth observation satellites. First of that category is THAI-PAHT, manufactured under the technology transfer agreement with SSTL in the UK and Thai Micro Satellite Company Co., LTD (TMSC).[36] THAI-PAHT was launched by Zenit-2 with other 5 satellites in 1998.[37] GISTDA is now manufacturing a remote sensing satellite, THEOS, under the cooperation with the Astrium.[38]

3. Indonesia

Indonesia was the first ASEAN nation to start space utilization. This country is large and diverse stretching more than 5.100 kilometers consisting of at least 17,508 islands. The application of space technology is of great importance for the development of Indonesian infrastructure. Such a necessity made Indonesia as the first Asian country to launch a telecommunication satellite.

NOAA,MODIS, SPOT and Radarsat, and Indonesia, NOAA, MODIS, and Landsat. Mitsubishi Research Institute (MRI), *Report of the Space Activities in the Asian Nations* (March, 2006), p.11.

[32] Shin Satellite, *A Company's Pamphlet: Bridging Digital Divide* (May 2006), p.1. Continuing supervision of Shin Satellite was later transferred to the ICT.

[33] Comprehensive telecommunications services are provided to Laos through a joint venture with the government of the Lao People's Democratic Republic and Shin Satellite, Lao Telecommunications Company Limited (LTC) founded in 1996. Also, Cambodia Shinawatra Company Limited (CAMSHIN) was jointly founded between Cambodia and Shin Satellite in 1993. Initial contract period is 25 years and 30 years respectively. As for Shin Satellite, Revenues from international services are slightly more than 55 percent in 2005. http://www.thaicom.net/annual/ANNUAL_SATTEL_ENG_2005.pdf, p.23 (date accessed: 1 August, 2006).

[34] http://www.thaicom.net/pages/our_satellite.aspx (date accessed: 1 June 2006).

[35] 18 iPStar gateways are found in 14 nations, or China, India, Indonesia, Thailand, Malaysia, Japan, Taiwan, Korea, Philippines, Vietnam, Cambodia, Myanmar, Australia, and New Zealand.

[36] TMSC was established by Mahanakorn University of Technology and Thai Satellite communication (TSC).

[37] Other five satellites are Resurs 01-2 (Russia), Techsat 1B (Israel), FASat Bravo (Chile), Safir 2 (Germany) and WESTPAC 1(Australia).

[38] MRI, *supra* note 31, p.10.

National Institute of Aeronautics and Space or LAPAN, founded in 1963, is responsible for conducting the research and developing the aeronautics and space technology and application. At the same time, ministerial-level National Aerospace and Space Council or DEPANRI was established based on Presidential Decree to serve as a legal bases to formulate national aeronautics and space policies, programs and regulations. LAPAN is the Secretariat of DEPANRI and both agencies have been working closely since their inception.[39] DEPANRI has adopted five-year space programs twice in 1998 and 2003. Goals of such space programs include the assurance and strengthening of national independence and integration as well as sustainable development of national economy through space development and application. For those purposes, the importance of international cooperation is highly required.[40]

In Indonesia, as in the case of Thailand, governmental agency LAPAN is conducting remote sensing activities while private companies are pursuing telecommunication business. With respect to the former, after the setting-up of the first ground station in 1969 in the suburbs of Jakarta, data receiving centers have since been increased to three in order to collect data from NOAA, MODIS, Landsat, SPOT, and ERS satellites extensively. Until 1998, data of Japan's JERS-1 had also been available at one of the three ground stations in Indonesia.[41]

As mentioned-above, Indonesia was the first nation in the Asian region which introduced a telecommunication satellite, or Palapa international satellite communications system. Palapa satellites have distributed communications to the Philippines, Thailand, Malaysia, Singapore and Australia, in addition to its intensified domestic use. Currently, three GEO satellites, Palapa C2 (launched in 1996), Telkom 1 (launched in 1999) and Telkom 2 (launched in 2005) are being operated by private companies such as PT SATELIT PALAPA INSONESIA, or PT SATELINDO[42] and Telkom. The multinational company, Asia Cellular Satellite (ACeS)[43] launched as well a Garuda satellite for mobile telecommunication in 2000.

Another important program pursued by LAPAN, in coordination with DEPANRI, constitutes national rocket development program. The development of sounding rockets dates back to as early as 1962. The first experimental launch of Kartika atmosphere sounding rocket, conducted in 1964, was a success. Further upper atmosphere sounding experiments were carried out three times in 1965 with the Kappa-8 rockets imported from Japan. The ten of Kappa-8 sounding rockets, developed for the participation in the International Geophysical Year (IGY) by Japan were transferred to Indonesia for its participation in the international scientific program, International Sun Quiet Year (ISQY). But the similar nature of the solid fuel rockets and the ballistic missiles resulted eventually in the prohibition of exporting such items and

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[39] *Ibid.*, pp. 18-23. See, also, http://www.lapan.go.id/ (date accessed: 31 July 2006).

[40] *Ibid.*

[41] MRI, *supra* note 31, pp. 27-28.

[42] PT SATELINDO was funded in 1993 through the merger of national companies, PT TELKOM and PTINDOSAT as well as private national company PT BIMAGRAHA TELKOMINDO. Comprehensive telecommunication service is authorized by the license granted by the Ministry of Tourism, Post and Telecommunications.
http://www.telkom.co.id/englishversion/investorrelations/laporankeuangan/TELKOM2006en.pdf (date accessed: 24 June 2006).

[43] ACeS, established in 1995, is a joint venture of PT Pasifik Satelit Nusantra (Indonesia), PLDT (Philippines), Jasmine International (Thailand) and Lockheed Martin Global Telecommunications (USA).

technology from Japan based on Diet resolution "Three Principles on Arms Exports" of 1967.[44] Such an incident explains the sensitive nature of the acquisition of launching vehicles as well as the current situation that only a few nations in this region own or develop national launching vehicles. Currently, due to the restrictions imposed by 34-member[45] Missile Technology Control Regime (MTCR), Indonesia can develop only sounding rockets for scientific observation with its own technology. A series of test missions in September 2004 showed that Indonesia could launch its rockets up to 100 kilometers successfully.[46]

Indonesia also reached a bilateral agreement with Russia to construct jointly a launching facility on the Biak Island near the equator in February, 2006.[47] This, however, remains to be seen whether this arrangement provides an advantageous launching site to Russia and access to international market or to enable Indonesia to own its own advanced launching vehicles.

Indonesia is at present drafting its own national space legislation as has been announced at the legal subcommittee of the COPUOS in 2006.[48] This may imply Indonesia's intention to embark upon the space business of providing launching facilities.

4. Malaysia

In Malaysia, the focus of space activities is put on the telecommunications and earth observations. Relatively as a newcomer in this field, Malaysian government established Agensi Angkasa Negara (National Space Agency of Malaysia) only in 2002, and its government is making the most of international cooperation in order to embark on space activities. In accordance with the 7th Malaysian development program (1996-2000), Astronautic Technology Sdn. Bhd, a 100-percent government-funded company was set up in 1997 to develop a microsat under the technology transfer agreement with SSTL of the UK. TinungSAT-1 (50kg) was successfully launched in 2000[49] and currently Razaksat[50] program has been pursued with the cooperation of Korean private company, SaTReC-I.

As in the case of Thailand and Indonesia, satellite telecommunication is being operated by a private company, MEASAT Satellite,[51] which develops its business in 13 countries in the Asian region. MEASAT is currently operating 2 telecommunications satellites and MEASAT-3 (24 C-ands and 24 Ku-bands) has been planned to be launched in 2006.

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[44] Prior to the export of Kappa-8 to Indonesia, 3 of the same rockets had been transferred to Yugoslavia.

[45] In Asia, Japan and Korea are the MTCR members.

[46] After tested in 1987 and 1995, four experimental launching of RX-250 rockets were successfully conducted in 2004 . See, e.g., MRI, *supra* note 31, p. 34.

[47] http://www.spaceref.fo.jp/mews/2Tues/2006_02_14pol.html (date accessed: 15 July 2006).

[48] Statement made by Indonesian delegation at the legal subcommittee in 2006.

[49] A/AC.105/INF.406(24 January 2002), p.3; ST/SG/SER.E/478 (22 August 2005) informed that TinungSAT-1 was not in operation any more.

[50] MACSAT was renamed as "Razaksat" program in 2003.

[51] A/AC.105/INF.407 (9 May 2002) p.2 on MEASAT- 1 and A/AC.105/INF.406 (January 2002), p.2 on MEASAT-2. Information of MEASAT-1, launched in January 1996 and MEASAT-2, launched in November 1996, was furnished to the UN in 2002 in accordance with GARes 1721 B(XVI) since Malaysia is no party to the Registration Convention. See, also, ST/SG/SER.E/478 (22 August 2005).

The other characteristics of the program include the cooperation with Russia in the training of Malaysian astronauts. Domestic competition[52] selected 4 candidates- 3 male and one female, in March 2006, and they are to be sent to Russia for training. Eventually, only one Malaysian astronaut would be on board the ISS while the other is a back-up personnel on the ground. Such a cooperation was made possible by the contract that Malaysia would purchase 18 Russian fighters.

Malaysia is currently neither planning to develop rockets nor a launching range. Also a member of the COPUOS, it, nevertheless, is not a party to any of the UN Space Treaties.

5. Other Nations and Regions

Taiwan owns and operates remote sensing satellites such as Rocsat-1 (launched in 1999), Rocsat-2 (launched in 2004), and Rocsat-3 (consisting of 6 micro satellites A to F, launched in 2006). Hong Kong also operates two small remote sensing satellites, Chinasat-1 and 2, which were launched in 1999 and 2006. Chinasat-2, with a capability of 2-meter resolution, passes over Taiwan twice a day. Satellites owned by both Taiwan and Hong Kong were launched by the US launchers on commercial basis.

Another example would be a US company, Space Adventures' announcement of constructing a spaceport in Singapore by 2009. Singapore, a party to Outer Space Treaty, Rescue Agreement and Liability Convention might be inclined to enact national space laws in order to prepare for any possible accidents.

Pakistan is the only country in this region that is a party to all five UN space treaties, or including the Moon Agreement (1979).[53] Pakistan owns two satellites, among which the BADR-B is found in the registry of the United Nations. BADR-B, a remote sensing satellite of about 50 kg was launched by Russian Zenit.[54] The unregistered first satellite was launched by Chinese rocket in 1990. Pakistan is also receiving remotely-sensed data from Landsat, NOAA, and SPOT satellites.

6. Conclusion

Succinctly put, the common features of the nations in this category would be as follows: first, the focus of space activities are placed on telecommunications and remote sensing. Second, there is a growing tendency to have one or two national remote sensing satellites, primarily made possible by the introduction of "microsat". Third, the data acquisition from advanced remote sensing satellite has been an established practice. Fourth, private satellite communications companies can be found in all the three countries. The statistics indicate that such a commercialization of outer space can be developed into a robust industry. On the other hand, the importation of launch vehicles (rockets) is not always pursued, since they cannot be easily procured from abroad owing to the restrictions on the technology transfer (as reflected under the MTCR), and their development from scratch would be exorbitantly expensive.

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[52] http://www.space.com/news/ap_050823_malaysia_astronaut.html (date accessed: 20 July 2006). 11275 Malaysians applied for the only one seat for being the first astronaut of his or her country in 2007 on board the ISS.
[53] Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (entered into force on 11 July 1984) 1363 U.N.T.S. 3.
[54] ST/SG/SER.E/403 (20 December 2001).

D. Third Category Nations

Nations which own stations for receiving data from foreign remote sensing satellites include Vietnam, the Philippines, Laos, Cambodia, Brunei, Sri Lanka, Myanmar, Bangladesh, Nepal and Mongolia. North Korea, a country with ballistic missiles, is said to pursue satellite launching.

Under the framework of the Disaster Monitoring Constellation (DMC) program and in cooperation with SSTL, Vietnam is pursuing its own micro satellite. Since DMC seems to represent one of the affordable opportunities towards a remote sensing satellite for a developing country, it is useful to mention DMC briefly below. The DMC,[55] a unique international partnership led by Surrey Space Center of the University of Surrey, combines national objectives (e.g., information gathering), public purposes such as humanitarian aid, and commercial purposes. In Asia, China, Thailand and Vietnam have participated in DMC. The first micro satellite of DMC is ALSAT-1 of Algeria (2002), which was followed by satellites of Nigeria (Nigeriasat-1), Turkey (BILSAT) and the BNSC/SSTL (UK-DMC) in 2003. The owners of largely-standardized DMC micro satellites are entitled to receive each other's data, which attracts developing countries.

The study in this section leads to the conclusion that the focus should be placed on the type of category 2 nations of space capability to promote the better space cooperation in this region. The main reasons are twofold: one is that many of the residual countries would follow such countries considering the speed of Asian economic growth. The other is that the realistic model to follow would be the relatively advanced, but not real spacefaring nations, or Thailand, Indonesia, and Malaysia.

Taking into account the above-mentioned characteristics, the effective measures for space cooperation in this region would be studied in the next section.

III. Possibility of Regional Cooperation

A. Asia in the Global Society

1. UN Framework

Since Asia as a region lacks the natural foundation for the regional cooperation, this author is of the view that the regional cooperation at this stage should be based on the established frameworks of international cooperation, preferably within the UN-related projects. One of the good opportunities would be the follow-up programs of the third UN Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) held in 1999 in which 100 nations and 30 international organizations participated.[56] "The Space Millennium: Vienna Declaration on Space and Human Development", adopted at the UNISPACE III, selected 33 specific actions - e.g., disaster mitigation, natural resources detection, and capacity building- to be developed in the 12 action teams[57] within the UN.[58] In Asia, China, India, Japan and Malaysia

[55] See, http://www.dmcii.com (date accessed: 30 July 2006).
[56] A/59/174 (23 July 2004), para.19.
[57] 11 action teams were established in 2001 to implement specific recommendations. A 12th action team was set up

have been appointed Chairmen of the respective individual action programs.[59] The members involved with follow-up programs have to report to the COPUOS on an annual basis, which could function as a "peer pressure" that could promote better implementation. The five-year review of the follow-up programs, or "UNISPACE III +5" review, was called for in 2004 by the General Assembly Resolution 54/68 adopted in 1999, which constituted a significant milestone in the implementation of UNISPACE III. Such an implementation mechanism can be regarded as useful for Asian nations for working cooperatively within the UN frameworks.

While UNISPACE III seems a first step for the regional close cooperation, a second step would include a defined agenda for the Asian region and this agenda shall be developed to build real understanding and confidence.

For that purpose, Economic and Social Commission for Asia and the Pacific (ESCAP), UN International Strategy for Disaster Reduction (UN/ISDR), and UN Regional Space Applications Programme for Sustainable Development (UN/RESAP) could be effective platforms for cooperation. UN/ISDR is a successor body created by the UN resolution in 1999[60] when the International Decade for Natural Disaster Reduction (IDNDR)[61] was over. ISDR opened a regional Unit for Asia and Pacific in June 2005 in Bangkok, Thailand as a direct follow-up to the World Conference on Disaster Reduction (WCDR) (January 2005) held just after the tragic tsunami in the Indian Ocean (December 2004). At the governmental plenary of the WCDR, the vital importance of earth observation was reconfirmed in every phase of disaster reduction ranging from early warning, to rapid response, and to preventive measures.[62]

The space cooperation in the framework of UN/ISDR seems, consequently, promising for the Asian region, since both the true necessity of this region, or precise agenda and the technological possibility exist taking into consideration the present capability of remote sensing satellites available to the region.

2. GEO: Global Governmental Cooperation Framework outside the UN System

Another desirable tool for cooperation can be found in the international activities for the global agenda that specifically fits the region. Among the platforms established outside the UN, Global Earth Observation System of Systems (GEOSS) within Group on Earth Observation (GEO) appears a more effective cooperative tool for the Asian region since the objectives of GEO include to build a sustainable, comprehensive and coordinated observation system of

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in 2003 to "improve knowledge-sharing through the promotion of universal access to space-based communication services", to which Malaysia was elected Chairman.

[58] 51 nations, 12 UN organizations, and 23 IGOs and NGOs participated in the Action Teams.

[59] China chairs an action team to "implement and integrated, global system to manage natural disaster mitigation, relief and prevention efforts", India, to "improve the management of Earth's natural resources" (A/AC.105/C.1/2004/CRP12), Japan, to "enhance capacity building by developing human and budgetary resources" (A/AC.105/C.1/2004/CRP/13), and Malaysia, to "improve knowledge-sharing through the promotion of universal access to space-based communication services."

[60] http://www.unisdr.org/. ISDR was formally inaugurated in 2002.

[61] IDNDR was designated in 1987 at the 42nd session of General Assembly of the UN.

[62] During the WCDR, workshops and sessions were held which underlined the significance of remote sensing. Examples would be Asian Workshop on Satellite Technology Data Utilization for Disaster Monitoring and a session titled Reducing Risk through Effective Use of Earth Observations.

systems, to provide open and easy access to data anytime and anywhere, and to increase the use of Earth observations.[63] GEOSS as being developed within GEO, would act under the belief that "the social benefits of Earth observation cannot be achieved without data sharing. GEOSS will ensure that the quality data required by users reaches them in a timely fashion and in an appropriate format. There will be full and open exchange of data, metadata, and products shared within GEOSS, recognizing relevant international instruments and national policies and legislation. To accomplish this technically, GEOSS will link database and communication networks efficiently through interoperability arrangements based on open, international standards."[64] As observed in the previous section, many nations in Asia are pursuing timely and user-friendly data for the development, and one of the responses is here in an international governmental quasi-organization, where political conflicts and regional rivalry could be minimized, because its objectives include collective safety and prosperity of the whole international community.

The concept of GEO originated from "G8 Science and Technology Action Program for Sustainable Development" declared at Evian G8 summit in June 2003. In accordance with the Action Program, a series of Earth Observation Summit were held in Washington, D.C. (July 2003), Tokyo (February, 2004) and Brussels (February 2005).[65] The third Earth Observation Summit established intergovernmental GEO and endorsed the "GEOSS-10 Implementation Plan." China, Japan and Thailand were selected as nations representing the Executive Committee of GEO (60 members and EC) at the first GEO plenary held in May 2005.[66] The Tsunami disaster that occured in December 2004, just before the inauguration of GEO, considerably influenced the framework of GEO, which later issued "Tsunami Declaration", and created Tsunami special committee and Tsunami Working Group. In the GEO-II in December 2005, China, Thailand, and Italy were elected presidents of Tsunami Working Group. Taking into consideration that Tsunami disaster provides a real opportunity for international cooperation for this region, working together in a broader setting would be a foundation upon which the true regional cooperation could blossom.

During the second GEO plenary, it was reported that a UN Disaster Management International Space Coordination (UN/DIMISCO) is to be established, thus enabling UN/DIMISCO-GEO space cooperation to mitigate and manage natural disaster. It should also be added that about 30 international organizations are participating in GEO, which implies that the expertise of such organizations is available to governmental GEO. The participants include a variety of intergovernmental and non-governmental organizations, such as UNEP, FAO, UNESCO, WMO, WHO, ISDR, EC, ESA, EUMETAT, and CEOS.[67]

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[63] GEO, *GEO Work Plan, Version 1 for Official Review*, GEO-0204-1 (21 October 2005), pp.1-7.

[64] *Ibid.*, p 4.

[65] Four ad-hoc GEO meetings were held between first and second Earth Observation Summit in order to draft the framework of GEOSS 10-year implementation plan, which was scheduled to be agreed upon at the second Earth Observation Summit in Tokyo.

[66] 12 members of the Executive Committee of GEO consist of 3 nations from Asia and Oceania, 3 from Europe, 1 from CIS, 2 from Africa and 3 from Americas.

[67] See, e.g., GEO, *GEO Work Plan for 2006, Version-2 for Approval*, GEO-0204-2 (28 November 2005).

3. International Non-governmental Cooperation

One of the most important of this category would be the Committee on Earth Observation Satellites (CEOS), a non-governmental international organization of space agencies. Established in 1984, 23 space agencies and 21 non-space organizations are currently members or associate members of CEOS. The Associate Members would include WMO, UNESCO, FAO, UNEP, ESCAP, UN/OOSA, and International Council for Science (ICSU). From Asia, the space agencies of China,[68] India, Japan and Korea are the members of the CEOS. The objectives of CEOS are international coordination of Earth observation programs and the construction of common data principles for maximum utilization of data and data products world-wide. The international organizations participating in GEO (WMO, FAO, UNESCO, etc.) are also associate members of CEOS, and CEOS itself is a member of GEO.[69] Through such closely pursued organization to organization cooperation, the overlapping objectives of GEO and CEOS would be better accomplished,[70] and the beneficiaries are nations, including the Asian countries, seeking better data products.[71]

The Asian nations can also build a common framework for cooperation and providing humanitarian aid when a disaster takes place. During UNISPACE III in 1999, ESA and CNES initiated to establish "Charter on Cooperation to Achieve the Coordinated Use of Space Facilities in the Event of Natural or Technological Disasters", or International Charter "Space and Major Disasters" (hereinafter "Disaster Charter"). The basic idea of Disaster Charter lies in the setting-up of a unified system of acquisition and delivery of space data to nations which are affected by natural or man-made disasters. Membership of the Charter is open to space agencies, space system operators, public or private (Article I). Parties would provide their own data on voluntary basis, no funds being exchanged between members (Article III 1). A variety of agencies, bodies and entities involving with disaster mitigation and crisis managements could participate as "associated bodies" or "cooperating bodies". (Article I). At present, 7 space agencies are members, among which the Indian Space Research Organization (ISRO) (IRS data are provided) and Japan Aerospace Exploration Agency (JAXA) (ALOS data) are Asian participants.[72] Although a political commitment, not a legally-binding instrument, Disaster Charter has already proved to be the most promising towards a true global cooperation once a natural or man-made disaster takes place. As of 5 October 2006, the networking for data sharing amongst members in time of a crisis has already been conducted 92 times out which 18 times have been for the Asian region. Considering that more than 50 percent of global disasters are reported to take place in the Asia and Pacific region,[73] thus more cooperation for sharing remote sensing data could be expected in this region.[74]

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[68] From China, Chinese Academy of Space Technology (CAST) and National Remote Sensing Center of China (NRSCC) are designated CEOS members. CEOS, *2004 Annual Report (2005)*, p. 12.

[69] See, e.g., www.ceos.org/.

[70] Cooperation between CEOS and GEO was declared in the 18th CEOS Plenary Meeting in 2004.

[71] IGOS-P, or earth observation strategy between CEOS and other international organizations was established in 1998, which is also one step for a strengthened international cooperation. With respect to Integrated Global Observing Strategy (IGOS), see. e.g., http://www.igospartners.org/index.htm.

[72] Other members are CONAE (Argentine), CSA (Canada), CNES (France), NOAA and USGS (USA), ESA, and DMC/BNSC (UK).

[73] http://www.unisdr.org/asiapacific/ap-about/about-isdr-mandate.htm (date accessed: 10 August 2006).

[74] http://www.disastercharter.org/disasters_e.html (date accessed: 5 October 2006).

B. Asian Regional Cooperation

While Asian space cooperation should begin in the frameworks of global, more authorized and established programs, at the same time efforts should be made for initiating real regional mechanisms for mutual benefits. In this section, two existing frameworks would be introduced as a reference of a more desirable platform.

1. First Governmental Organization: APSCO

The signing ceremony was held in Beijing on 18 October 2005 for the establishment of the first comprehensive intergovernmental space organization, or Asia-Pacific Space Cooperation Organization (APSCO). Bangladesh, China, Indonesia, Iran, Mongolia, Pakistan, Peru and Thailand signed the 35-article Convention. In contrast, while present there as observers, Argentine, Brazil, Malaysia, Philippines, Russia and Ukraine failed to sign it. In addition, although Chile and Korea attended when APSCO Convention[75] was adopted in November 2003, both countries were absent at the signing ceremony. The APSCO would enter into force once the five nations have deposited with the Host Government of their instruments of ratification or acceptance (Article 29.1), and it would then initiate its formal activity in a near future.[76] Turkey signed the Convention on 1 June, while it never participated in drafting process.[77]

The objectives of APSCO include to promote and strengthen the development of collaborative space programs among the member states, to take effective actions to assist the member states in space research, applications and training, to promote cooperation in joint development of space technology and applications, to enhance cooperation to promote the industrialization of space, and to contribute to the peaceful uses of outer space (Article 4).

The Asia-Pacific Multilateral Cooperation in Space Technology and Applications (AP-MCSTA), established in 1992 based on Memorandum of Understanding (MOU) among space agencies of China, Pakistan and Thailand,[78]gradually developed into APSCO. The objectives of AP-MCSTA include the promotion of peaceful cooperation in space applications in the Asia-Pacific, the dissemination of small satellites technology, and capacity building.[79] Started as a flexible "AP-MCSTA Mechanism", it was not until 2001 conference in Beijing when a recommendation for the setting-up of an international legal person out of AP-MCSTA was unanimously agreed among the sixteen space agencies. After the 2002 workshop to draft APSCO Convention, the Chinese government sent draft articles to 28 nations in Asia and Pacific to urge to participate in the drafting process.

Even after APSCO Convention was opened for signature,[80] AP-MCSTA was not only dissolved into the Secretariat of the APSCO, but continued functioning as before. However,

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[75] APSCO Convention is not an open instrument.

[76] Mongolia and China ratified the Convention. Host government means Government of People's Republic of China (Article 2 b).

[77] Secretariat of AP-MCSTA, *Asia-Pacific Space Outlook*, No.9 (June 2006), pp.1-4.

[78] As for Thailand, Ministry of ICT signed the MOU due to the nonexistence of the devoted space agency.

[79] Working Groups were established to concentrate on small satellites, telecommunication technology, disaster management and monitoring system, and remote sensing application technology.

[80] 31 July 2006 was the deadline for the signature (Article 28).

looking into the function of AP-MCSTA, it seems as if it were a part of the APSCO. It may be said at this stage that the organizational relationship of AP-MCSTA and APSCO is not so clearly defined, which may be the reflection of the outstanding presence, capability and role of China in the mechanisms of AP-MCSTA and APSCO. As one example, the quarterly magazine of AP-MCSTA *Space Outlook* reported that the Chinese government donated reception stations to 7 signatory states of the APSCO Convention of China's broadcasting satellites data in March 2006.[81]

While it cannot be denied that the APSCO is one of the big positive steps for regional cooperation, but it is an approach different from the one for ESA-type cooperation. In the APSCO, China is dominant and regional uniformity is less. Also, participating members of APSCO are not typical Asian countries. It remains uncertain whether the Latin American countries, such as Peru and Chile, could practically be included in the Asian cooperation scheme. However, it should be highly useful as the first such venture in this region.

2. Regional Space Agencies Cooperation: APRSAF

While the APSCO is being led by China, the Asia-Pacific Regional Space Agency Forum (APRSAF) has been a forum led by Japan in order to enhance regional space capabilities. The APRSAF was established in 1993 in response to the declaration adopted by the Asia-Pacific International Space Year Conference in 1992, and has been holding annual meetings to promote space utilization in the Asia-Pacific region through exchange of views and to seek measures to contribute to the socio-economic development in the Asia-Pacific region.[82] Twelve annual meetings have been held between 1993 and 2005.[83] Different from APSCO, Iran, Brazil, Peru, Chile, Ukraine, and Turkey have never attended its meetings, although space agencies of Australia, Canada, France, Germany, and the USA, which are non-participants of APSCO process, are sometimes attendees.

The regional common agenda was identified through the extensive exchange of views conducted at the first five meetings (between 1993 and 1998). As a result, it was concluded that the most required was better networking for data sharing, more earth observation (including the acquisition of micro satellites) and the building of human resources to deal with space applications. Starting with the 8th meeting in 2001, recommendations have been adopted in each of the four sub-committees,[84] and the implementation of which have also been reported at the next annual meeting. Indian Ocean Tsunami in December 2004 greatly accelerated the otherwise already recognized necessity of disaster mitigation program within the APRSAF. Based on the conclusion of an "Asian Workshop on Satellite Technology Data Utilization for Disaster Monitoring" during World Conference on Disaster Reduction (WCDR) in January 2005 held in Japan, and that of the APRSAF technical session in May 2005 (Malaysia), 2005 APRSAF annual meeting in Japan established a Disaster Management Support System (DMSS) in Asia-Pacific Region as the best-effort, voluntary initiative by the participating organizations. That system

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[81] AP-MCSTA, supra note 77, p 7.

[82] See, e.g., http://www.aprsaf.org/.

[83] Between 1993 and 1997, and in 1999, 2000, and in 2005, meetings were held in Tokyo. Annual Meetings have been also held in Mongolia, in 1998, Malaysia, in 2001, Korea, in 2003 as well as Thailand and Australia in 2004. No meetings were held in 1995 and 2002. In a 2006 meeting, space agencies of 21 states and several international and national organizations of various legal natures participated including non-governmental, non-legal person of AP-MCSTA.

[84] Four areas are as follows: education and outreach, earth observation, telecommunication application, and use of space environment.

would be built in three phases: a pilot project named "Sentinel Asia" would be conducted in 2006 and 2007, which is to be followed by the establishment of an earth observation and satellite communication system (2008-2009) and, finally a comprehensive DMSS (from 2010).

The "Sentinel Asia", internet-based disaster-related information distribution backbone, would be made possible not only by the space community of APRSAF, but with the support of international organizations and entities (such as UN/ESCAP, UN/OOSA, and ASEAN), disaster reduction community (e.g., Asian Disaster Reduction Center)[85], and communication networks (e.g. Digital Asia information sharing platform,). ALOS (JAXA) and MODIS (NASA) data are to be provided and training for capacity building would be jointly conducted between JAXA and Asian Institute of Technology (AIT) of Thailand. Joint Project Team (JPT)[86] was initiated in Vietnam in February 2006, with 23 agencies from 14 countries and 4 international organizations.[87]. For the second JPT meeting, held in Thailand in June 2006, India and Korea joined for the first time, and India even suggested the possibility of offering its IRS data. For the second step of the DRSS, China, India, Japan, Korea and Thailand are deemed to be candidates for offering satellite data as the possessors of remote sensing capability.

3. Toward the Comprehensive Asian Cooperation

For the development of the Asian space cooperation, nothing would be more important than the appropriate and realistic agenda-setting of the region. From that standpoint, the Asian cooperation is heading in the right direction with the emphasis being placed upon the dissemination and sharing of data from remote sensing satellites for disaster mitigation and environmental monitoring. Especially, the Asian capacity building in space technology and application is being successfully carried out within the global frameworks such as UN, GEO and CEOS. Then, it seems that the next step would be to bring individual capabilities developed through the global cooperation into one common voice of this region. In order to make it possible, it seems more effective to build regional specific platforms for cooperation. While the creation of two different organizations having common goals would not necessarily minimize the desired cooperation, it would, nevertheless, be wastage of resources in the region. Thus, it seems essential that the APSCO and the APRSAF, though charged with slightly different tasks, should work in such a way that regional cooperation should be further developed. Noting the different legal nature between the APSCO and APRSAF, it could be possible. Non-governmental APRSAF seems to have recently found its mandate of promoting the disaster reduction satellite systems, and intergovernmental APSCO has been assisting members-to-be in small multi-mission satellites project. Together with Bangladesh, Iran, Korea, Mongolia, Pakistan and Thailand, China has been manufacturing small satellites, and the first of which would be launched in 2007.[88] Making the most of the remote sensing capability being enhanced by the APSCO cooperation, individual states could actively join the second step of DRSS initiative in the APRSAF. Taking account the fact that most members-to-be in APSCO are also participants of Sentinel Asia, or the first step of DRSS of APRSAF, it would be possible to provide their

[85] ADRC was established in 1998 in Japan as a contribution to the IDNDR. Among 25 members, Asian nations include Bangladesh, Cambodia, China, India, Indonesia, Japan, Nepal, Pakistan, Singapore, Sri Lanka, and Thailand.
[86] Terms of the Reference (TOR) of the JPT was adopted at the first JPT meeting in February 2006.
[87] Among APRSAF participants, India and Korea did not join the first JPT while China, Indonesia, Malaysia and Thailand did.
[88] "V International Exchange and Cooperation, Major Events 2", in *China's Space Activities in 2006*, *supra* note, 17...

satellite data as elements of DRSS. In this connection, it should not be overlooked that AP-MCSTA is already a participant of APRSAF.

The APRSAF could also participate in some of the APSCO programs as a positive gesture of confidence-building in this region. In that case, the different legal nature between APSCO, an international governmental organization and APRSAF, a regional consultative forum would not become a big obstacle, since a series of precedents already exist. The strict sense of international legal personality has not been required for becoming, an attendee, observer, or an associate member of the regional organizations as described above.[89]

As repeatedly claimed, Asian space cooperation should be nurtured in the global frameworks. In order to attain it effectively, the Asian compliance with and participation in the present international space law would be most important. In the Asian region, among the categories 1 and 2 countries, Malaysia is not a party to any one of the UN treaties on outer space although it signed the Outer Space Treaty and the Rescue Convention. Philippines, in a transitional stage from category 3 to category 2 nation, is the state party only to the Moon Agreement. However, the overall treaty status of the Asian nations of the UN treaties on outer space is as good as or better than the other areas of the world, taking into account the fact that even the Outer Space Treaty has only 99 state parties as of today.

Concerning the participation in the UNCOPUOS, China, India, Japan, Malaysia, Mongolia, Pakistan, Philippines, Korea, Thailand and Vietnam are members thereof, which almost overlaps the countries belonging to category 1 and 2 and such countries should lead the Asian space cooperation in order to promote peaceful uses of outer space.

IV. Conclusion

As described above, the next five years we should see the enhancement of the regional capability of remote sensing for the disaster monitoring and environmental observation in the frameworks of UNISPACE III follow-up programs, other UN-related programs, GEOSS of GEO, CEOS, APRSAF and APSCO. As responsible actors in the exploration and use of outer space, the Asian nations should be aware of common challenges facing the international space community. One important example would be of space debris mitigation, especially because the number of the satellites being owned and operated by the Asian nations is on the rapid increase.

Among the Asian nations, the space agencies of China, India and Japan are members of the Inter-Agency Space Debris Coordination Committee (IADC), a non-governmental organization, in which IADC guidelines were adopted in 2002.[90] Noting such a progress, the Scientific and Technical Subcommittee (STSC) of the COPUOS had mandated the IADC to draft space debris mitigation guidelines for the Subcommittee in 2001, which are planned to be adopted in 2007 at the earliest.[91] Space Agencies of China, India and Japan have expertise in debris mitigation measures. Especially

[89] One example would be the GEO. A governmental conference, not a formal organization with international legal personality, GEO is, nevertheless, a frequent participant in space-related organizations such as UN/OOSA and CEOS.
[90] IADC Space Debris Mitigation Guidelines, IADC-02-01 (15 October 2002). The Guidelines were supplemented in 2004.
[91] IADC submitted seven-part guidelines in 2004, which were not accepted due to the opposition by some member states and since returned to elaborate at the IADC.

JAXA has a long experience in this regard, since the National Aerospace Development Agency of Japan (NASDA) was the second space agency in the world which adopted national space debris mitigation guidelines based on the NASA guidelines (1995).[92] Utilizing the cooperation vehicle of APRSAF, three space-faring states in Asia could help the region to prepare individual national plans for the space debris mitigation in accordance with the IADC standards.

Other than China, India and Japan, it is not easy for the individual states to be equipped with full-fledged launching capability. Considering the current regional political environment it may seem unrealistic to plan to have a common rocket system (e.g. the Asian version of Ariane series) however the door should be kept open for the future. Establishing a multinational sea-based or air-based launching company for small satellite, could be the first step for the regional cooperation concerning the launching capability. Although national cooperation in the launch vehicles is much more difficult due to the inevitably involved MTCR, private multilateral activities could be more realistic. For the increasing number of small satellites, reasonably priced smaller launching vehicles should be welcomed.

Lastly, the possibility should be pointed out about the harmonized application of UN Treaties on outer space among the Asian nations. In December 2004, GA Resolution 59/115 was adopted, titled "Application of the concept of 'launching State'" based on the discussion of the Legal Subcommittee of the COPUOS between 2000 and 2002. That resolution recommends that the states while conducting space activities should consider enacting and implementing national laws in fulfilling international space law, and recommends further that the states should consider the conclusion of agreements for the purpose of the clarification of the concept of "launching State" and state of registration. The 2004 Resolution implies the recommendation to re-define UN space law regime, since UN space treaties have become outdated as the commercialization increases. Nevertheless, it is difficult to amend them because of the requirement of attaining consensus amongst the 67 member states of the COPUOS.

In this globalized society, European challenge today would be the Asian common agenda of tomorrow. As European (and some North and South American) scholars have conducted cooperative research in that regard, through, e.g., "Project 2001" and "Project 2001 plus"[93] Asian researches and Asian nations might venture in this direction within a decade. In that case, the Asian association of researchers and/or like-minded nations would require the platform to address collectively the obstacles for the peaceful and commercial use of outer space. In May 2005, Republic of Korea enacted the Space Exploitation Promotion Act, as the first comprehensive space activities act in the Asian region.[94] That is just the beginning and the increasing number of nations is conscious of the necessity of filling in the *lacunae* of the present UN space treaties. The day should come when either regional agreements for that purpose or, at least, the regional harmonized application of the UN treaties through individual national space activities acts would be seriously considered. It is not so unrealistic to discuss the matter in a forum where all the Asian nations could come together.

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[92] NASDA-STD-18 (1996). It was since amended and renamed JMR-0003A due to the organizational change from NASDA to JAXA.

[93] Karl-Heinz Boeckstiedgel, ed., *'Project 2001'- Legal Framework for the Commercial Use of Outer Space* (Carl Heymans Verlag, 2002); Stephan Hobe, Bernhard Schmidt-Tedd & Kai-Uwe Schrogl eds., *'Project 2001 Plus'-Global and European Challenges for Air and Space Law at the Edge of the 21st Century* (Carl Heymanns Verlag, 2006).

[94] Doo Hwan Kim, "Korea's Space Development Programme: Policy and Law", 22 *Space Policy* (2006) pp. 110-117.

Japanese Space Activities and JAXA

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1. Japanese Legal Framework on Space Activities

2. History of Japan's Space Activities

3. Japan's Space Policies & JAXA Long Term Vision

4. JAXA's Programs Now & Future

5. Cooperation with Asia-Pacific Region

Japanese Legal Framework on Space Activities

1. International Space Treaties

- Outer Space Treaty: ratified in 1967
- Rescue Agreement: acceded in 1983
- Liability Convention: acceded in 1983
- Registration Convention: acceded in 1983

So far, these treaties have been applied directly to space activities carried out by Government or Government-affiliated agencies such as former NASDA or JAXA, based on the premises that any private sectors' space activities would be unforeseen.

In 1983, just before requesting Diet to approve the above-mentioned 3 treaties, Cabinet decided Government should take necessary legislative measures in case of foreseeing situation under which Japan cannot cope any more with existing laws and regulations.

- ISS Int'l Gov. Agreement(IGA): entry into force in 1992(original IGA), in 2001(current IGA)
- Japan-US Cross-waiver of Liability Agreement: entry into force in 1995

Japanese Legal Framework on Space Activities

2. Domestic Laws

- **NASDA Law: enacted in 1969 (abolished in 2003)**
- **JAXA LAW: enacted in 2002**

⇒Objectives, Scope of Activities, Organization, Relation with Government (incl. Space Activities Committee), Planning, Compliance with Int'l Space Treaties, Mandatory TPL Insurance for Launching, etc.

3. Issues foreseen

- No domestic laws governing and allowing space activities directly carried out by private sectors exist. While, current movement toward commercialization and privatization in Japan, such as small satellite activities mainly by universities, and small rockets by universities or NPO, or space tourism plan by venture companies are gradually getting real nowadays.

- In order for Government of Japan to abide by UN Space Treaties domestically, needs to consider the necessary legislation* to cope with such situation will increase in the near future.

  *Mechanism for licensing and supervising, Liability risk allocation between government and private sectors, Procedure for space objects registration, Competent Minister, Penalty, etc.

- Appropriate legal framework for future international Moon or Mars manned exploration programme to stably implement, considering IGA or Moon Treaty.

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History for 50 Years

Last year (2005) was ...

- 50-year anniversary of "Pencil Rocket"
  - Japanese 1st launch experiment executed by University of Tokyo (former ISAS) in 1955

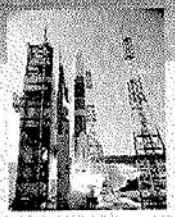
- 30-year anniversary of N-I launch vehicle
  - Japanese 1st launcher transporting application satellites by former NASDA in 1975

50 years

Pencil Rocket
Length: 0.2m
Mass: 0.0002t

H-IIA
Length: 53m
Mass: 285t

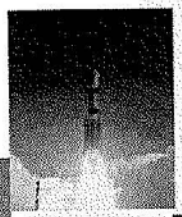
History of Japan's Space Activities



New Era with JAXA Vision

Feb. 2005

Successful RTF of H-IIA



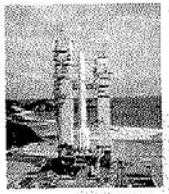
JAXA Establishment Oct. 2003

Failures & Challenges
H-IIA, ADEOS,

1990s

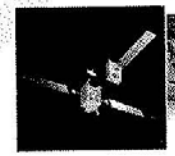
Technological Maturity,
Diversification, Internationalization

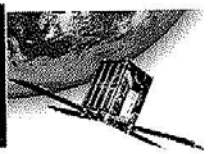
H-II, ETS-VI, MOS, ISS etc.,



1980s

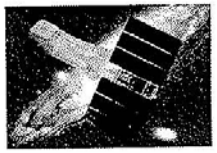
Transition to Independent Development
and Beginning of Diversification
H-I, Start of H-II Development.





1970s

Import of US Technology, Practical
Application Satellites
N-I, N-II, BS, CS, GMS



Oct. 1969 NASDA Establishment

1950s

Start of Space
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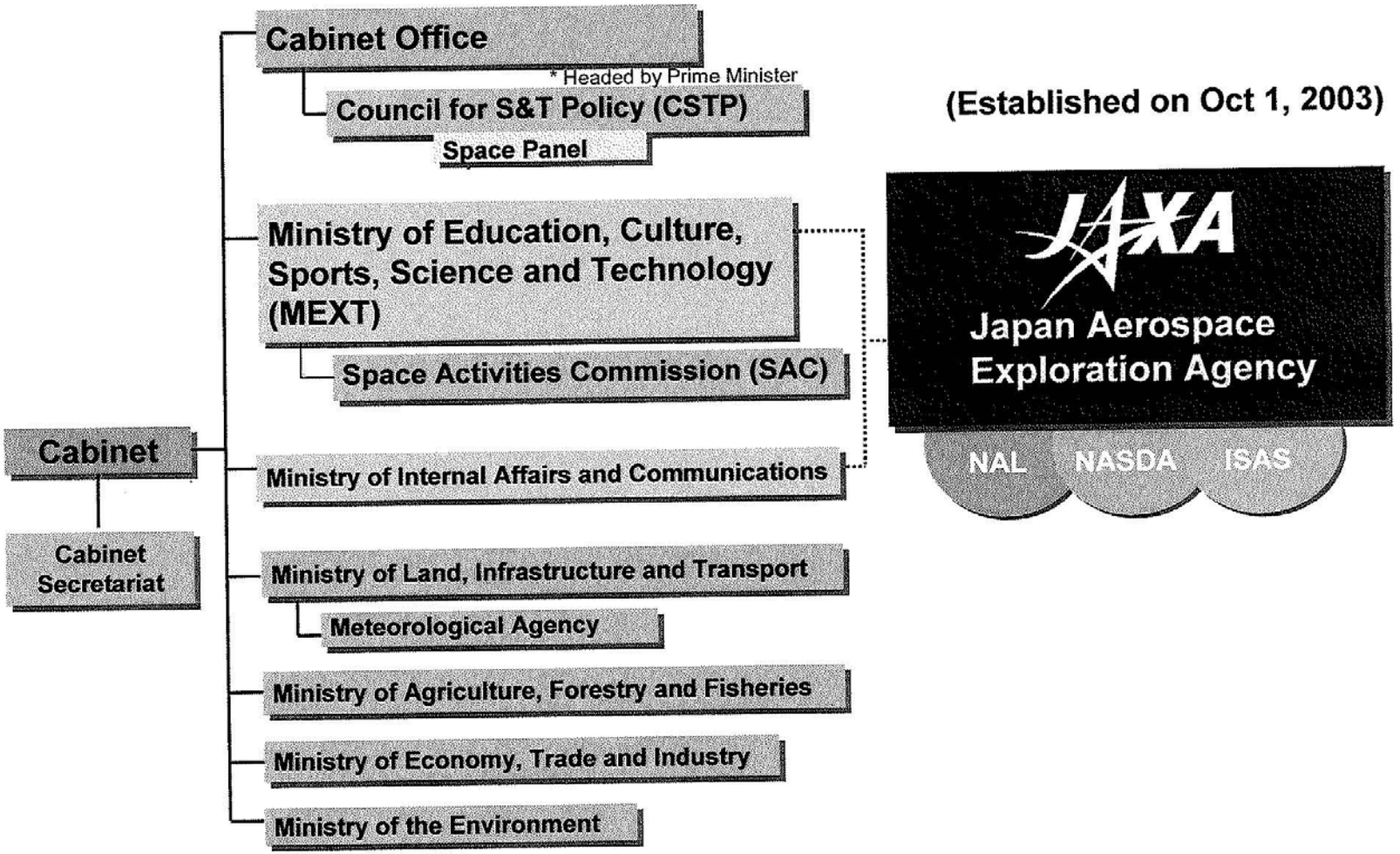
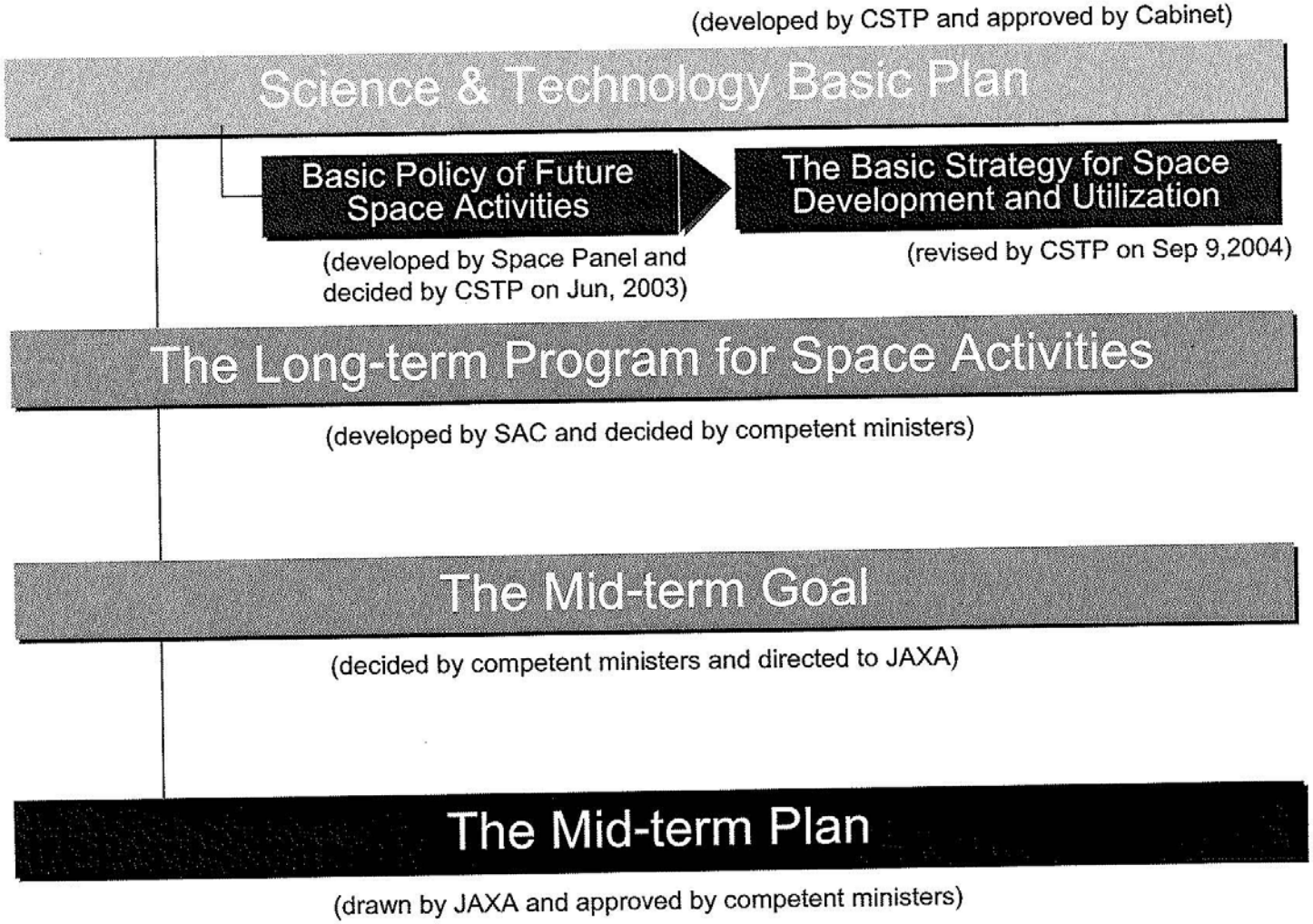
3. Japan's Space Policies & JAXA Long Term Vision
4. JAXA's Programs Now & Future
5. Cooperation with Asia-Pacific Region

Japan's Space-Related Organizations

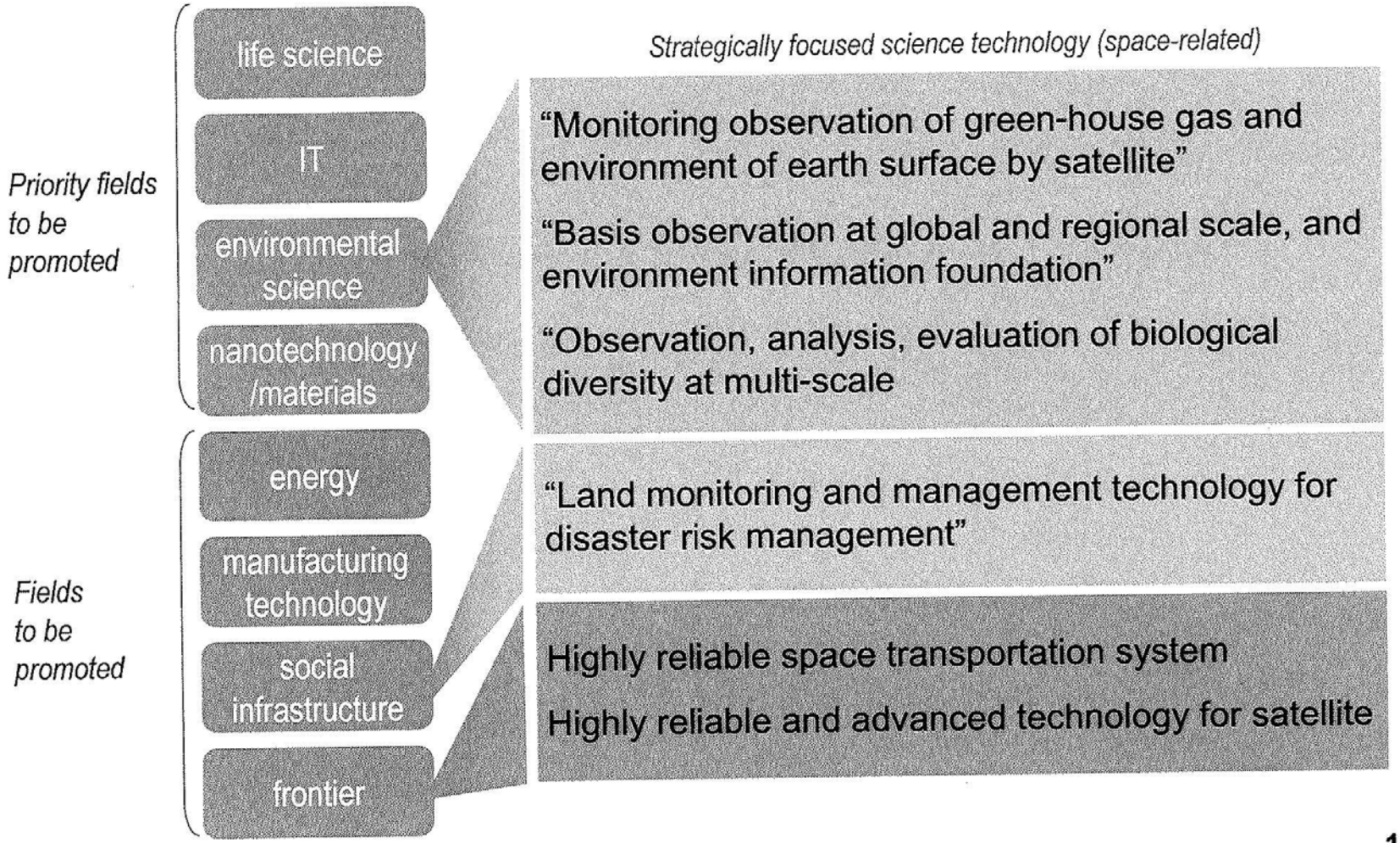


(Established on Oct 1, 2003)

Structure of Japanese Space Policy & Plan

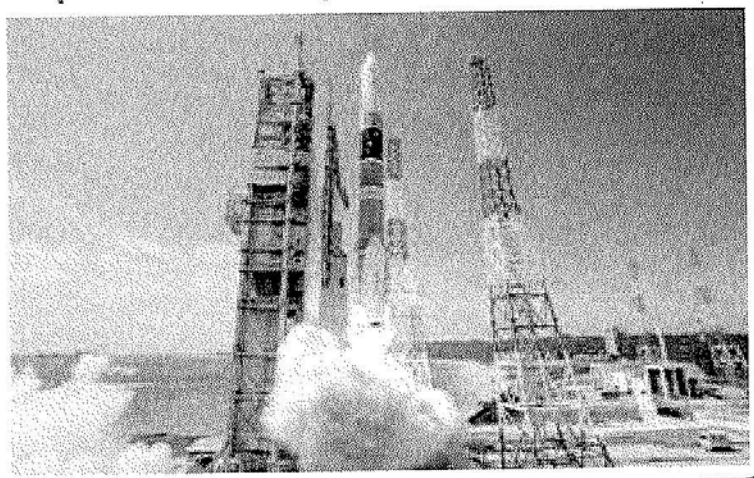


The 3rd Science Technology Basic Plan
~Strategically Focused S&T~

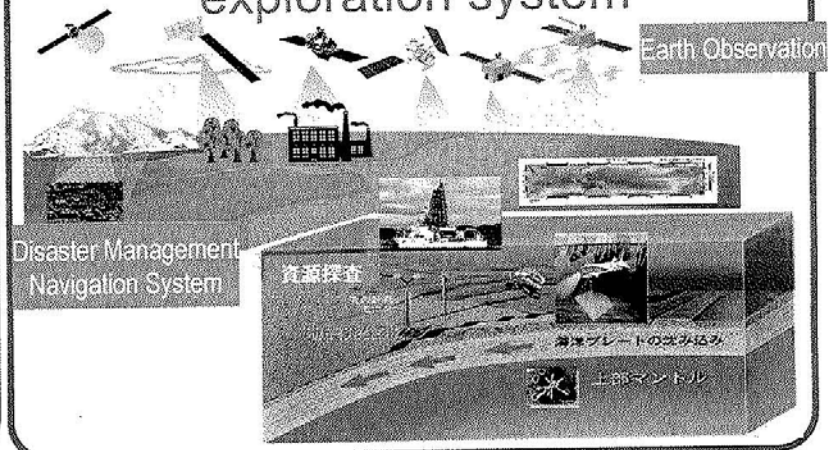


National Key Technology Selected from Strategically Focused S&T in the 3rd S&T Basic Plan

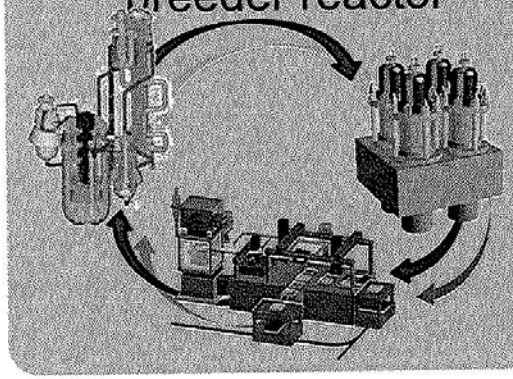
Space transportation system



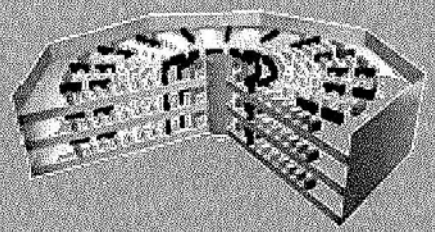
Ocean and earth observation exploration system



High-speed breeder reactor



Next-generation super-computer

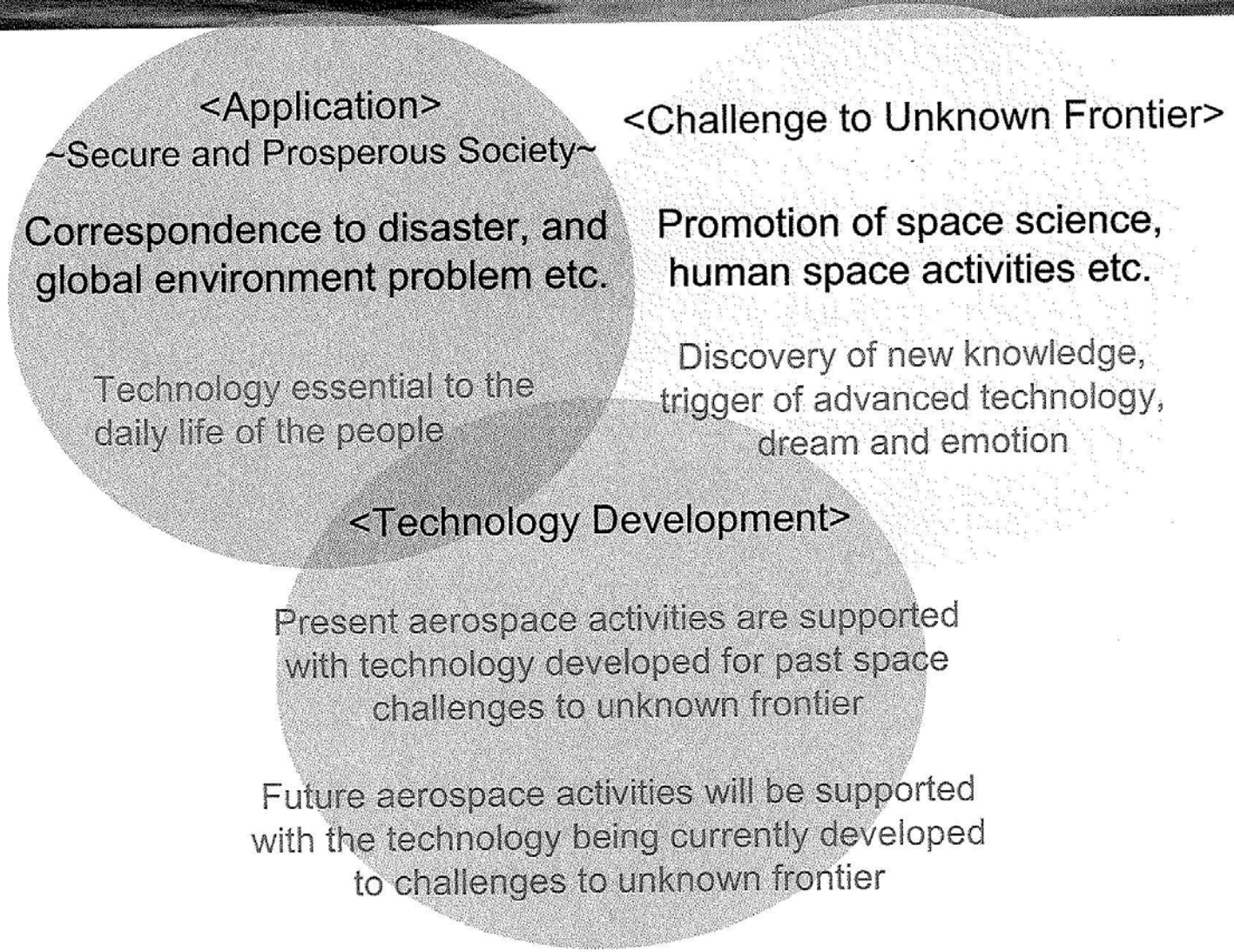


X-rays free electron laser

JAXA 2025

- JAXA established its long term vision, "JAXA 2025", in April, 2005.
- "JAXA 2025" is JAXA's proposal on its own initiative to be pursued to realize ideal situations in aerospace activities in the next 20 years.
- JAXA hopes that "JAXA 2025" would be appropriately taken into national strategies, various plans and policies of Japan.

Concept of JAXA Vision – JAXA 2025 –



JAXA Vision 2025

1. Enhancement of Space Applications

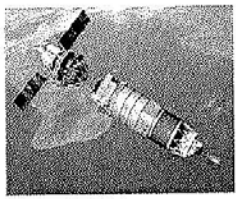
1) System for natural disasters and crisis management
2) System for monitoring global environment

2. Promotion of Space Science

1) Cosmic observation and solar system exploration
2) Establishment of Lunar Base
3) Deep Space Harbor at the Lagrange Point

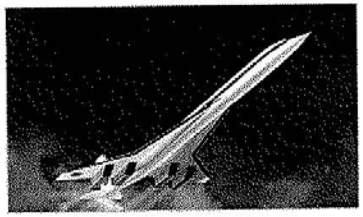
3. Strengthening of Space Transportation System

1) Improvement of reliability of launch vehicle
2) Development of inter-orbital transportation system
3) Research and development of manned system



4. Research and Development of the Next-generation Air Transportation System

1) Development of Japan-made passenger aircraft
2) Research of supersonic (Mach 2) and hypersonic (Mach 5) aircraft technology
3) Development of flight-safety system



Implementation Policy

Next 10 years:

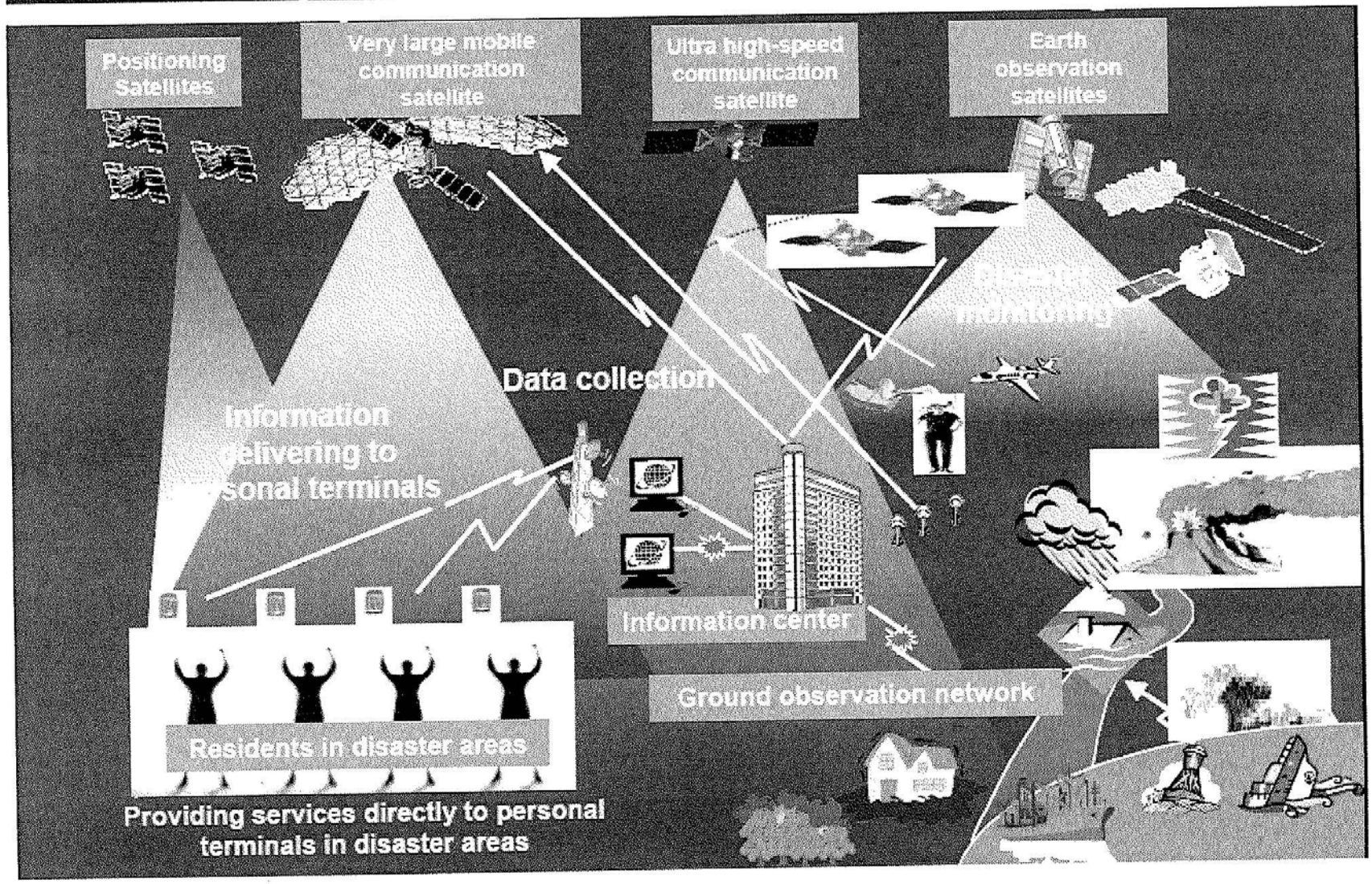
Prioritize the realization of an innovative space utilization system that can contribute to building the secure and prosperous country.

Following 10 years:

Continue to promote the wide use of aerospace technologies in the society.

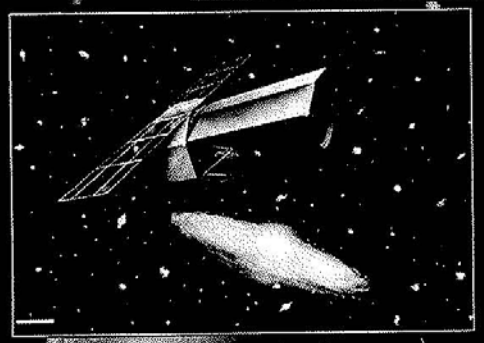
Based on the executive direction set by the government, take actions toward the realization of new space utilization, including the utilization of the Moon, and Japan's own human space activities.

Goal of A Disaster Risk Management System in the Asia-Pacific Region



Future Space Observation and Solar System Exploration (Image)

Astronomical Satellite

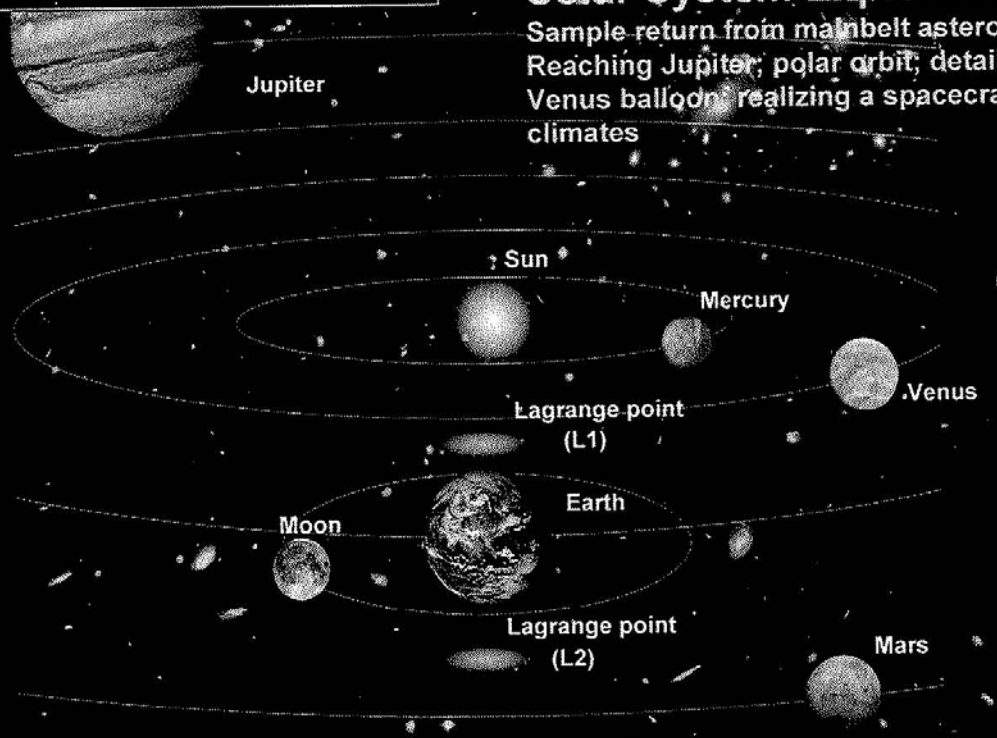


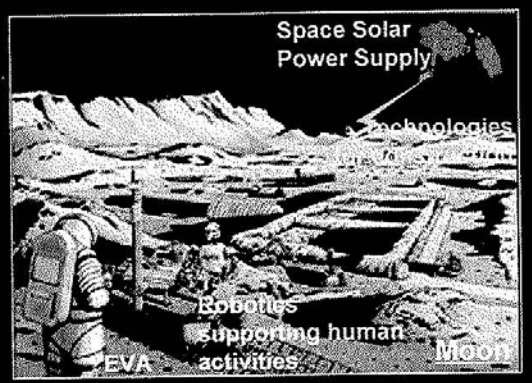
Space Observation

first galaxy and black holes
Investigating some trails of lives on Earthtype planets beyond the solar system
Revealing the unknowns of the dark energy

Solar System Exploration

Sample return from mainbelt asteroids
Reaching Jupiter; polar orbit; detailed explorations
Venus balloon; realizing a spacecraft to Mars; and unveiling planetary climates

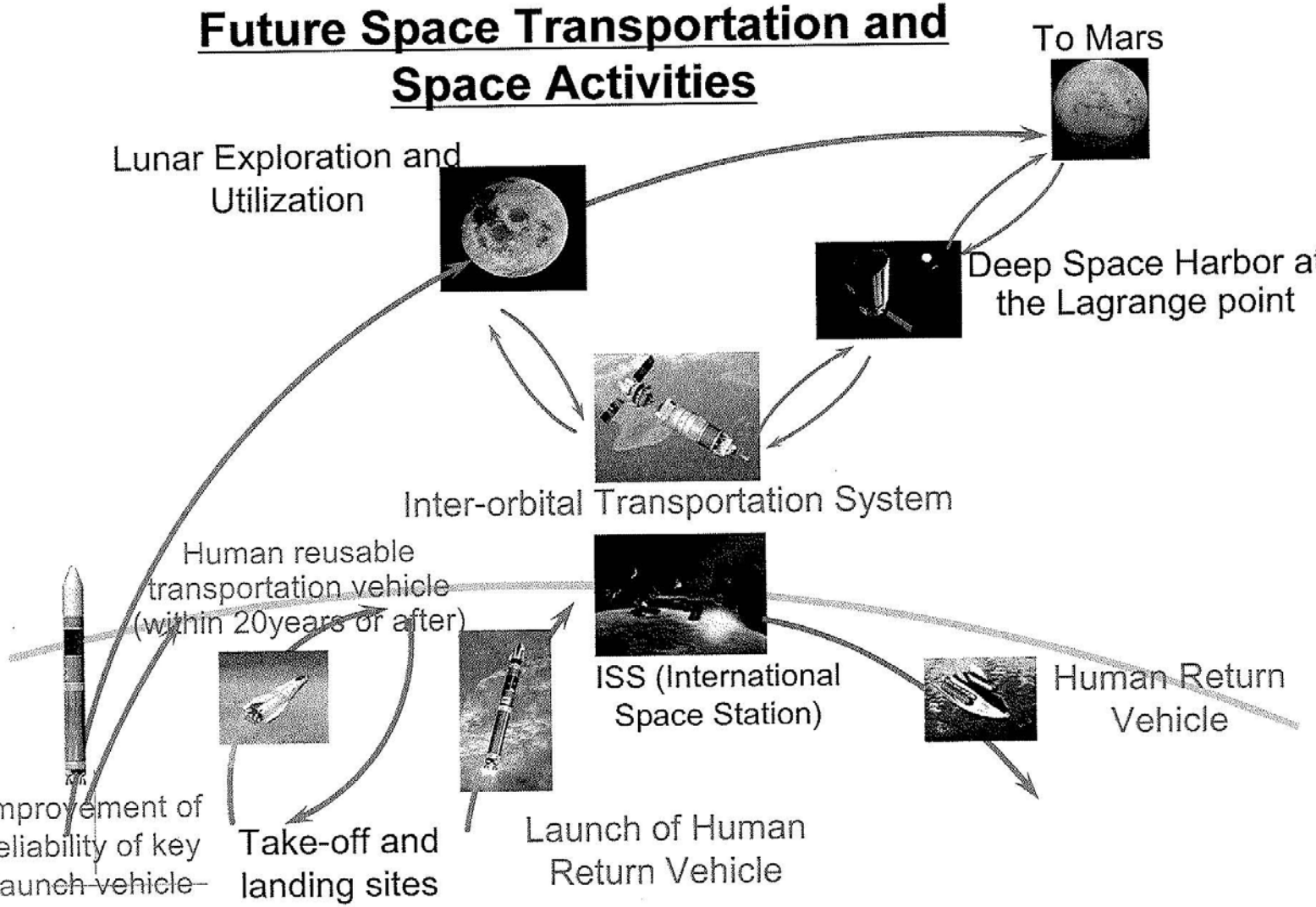




Lunar Base

Strengthening of Space Transportation System

Future Space Transportation and Space Activities



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JAXA's Programs

Space Applications Program
(Earth observation, communication, positioning etc.)

ISS Program
(ISS, manned space activity & utilization etc.)

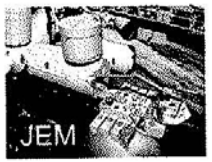
Space Science
(Astronomy, solar/planetary research etc.)

Space Flight & Operations
(Transportation, launch facility, tracking etc.

Space Technology

Aviation Program

Reliability Improvement Program



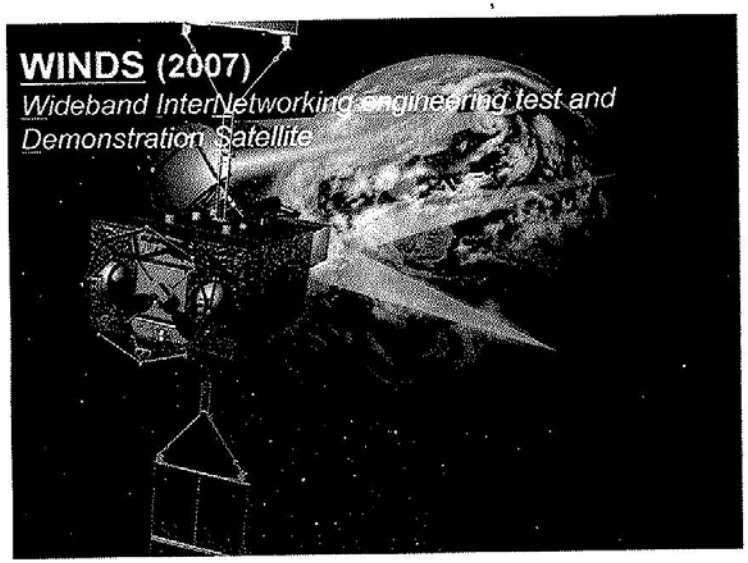
International cooperation (focus on cooperation with Asian countries)

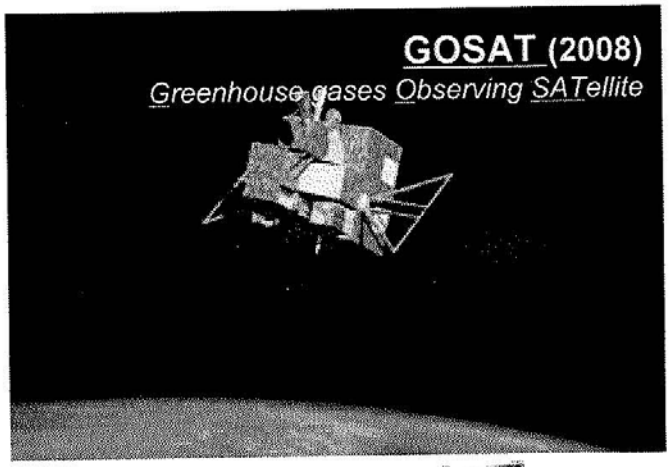
Collaboration with Private, Academic, Sectors

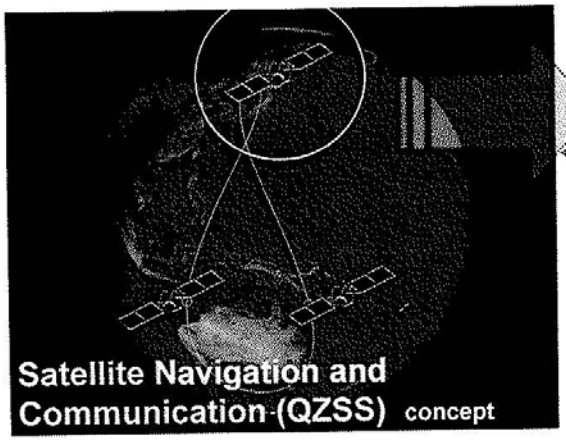
Graduate Education / Training

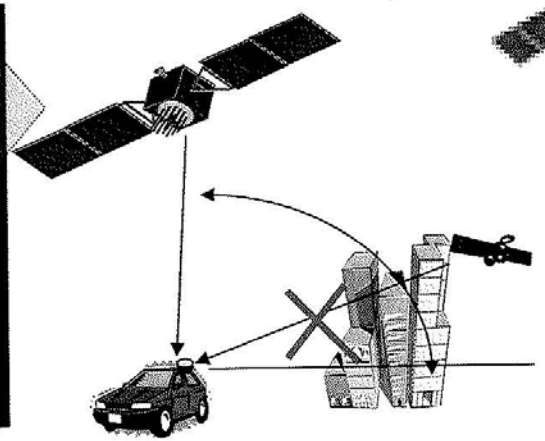
Spin-off

Future Application Satellites

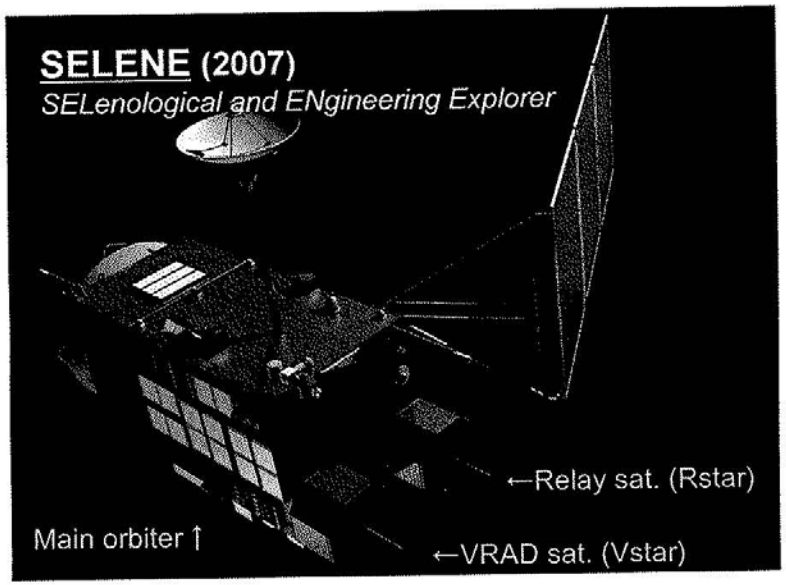


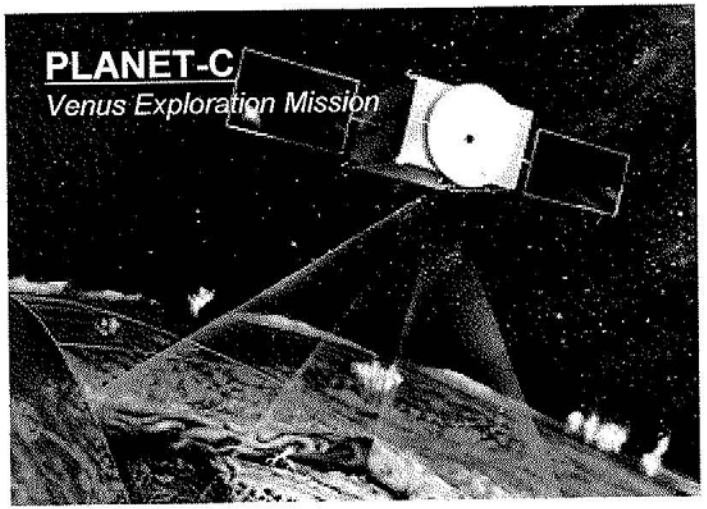


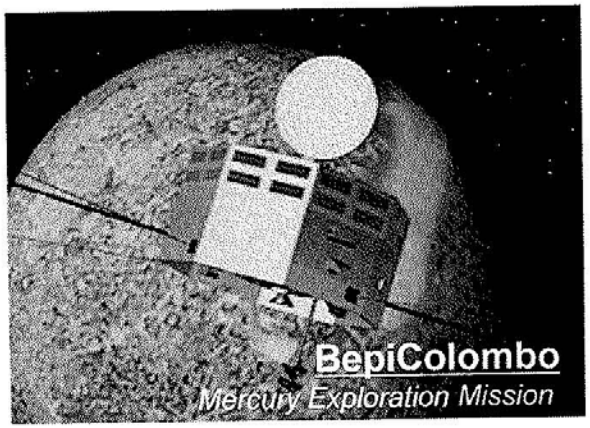




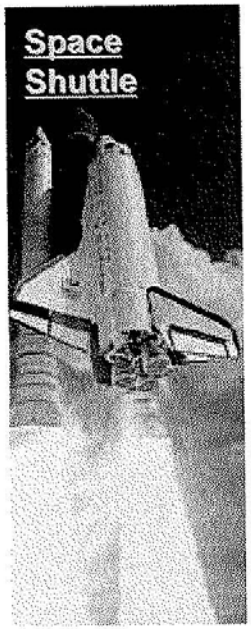
Future Science Satellites



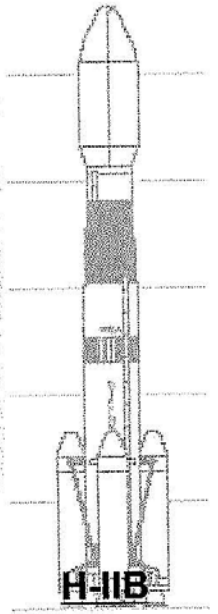


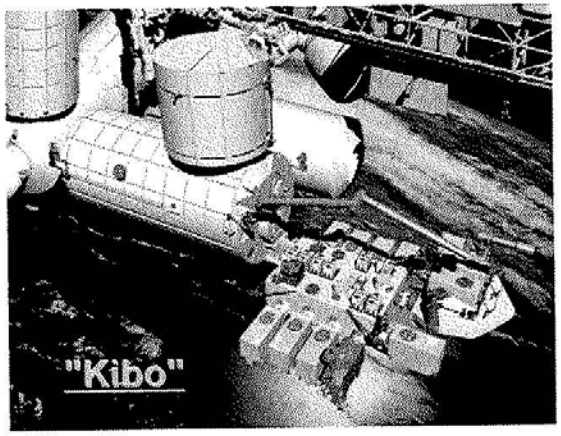


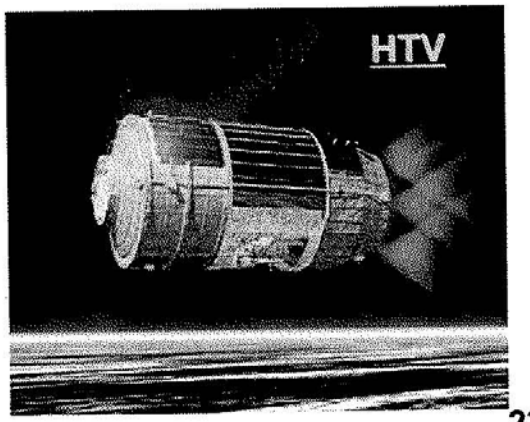
Space Station Program



- Japanese Experiment Module, "Kibo", will be launched by Space Shuttle from FY2007.
- Japanese Astronauts will participate in On-orbit assembly and system verification of “Kibo”.
- HTV will transport cargo to the ISS.
- H-IIB is under development for HTV launch.







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Asia-Pacific Regional Space Agency Forum

APRSAF

http://www.aprsaf.org/

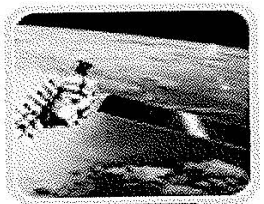
Established in 1993

[Participation] Space agencies, related governments, regional and international organizations

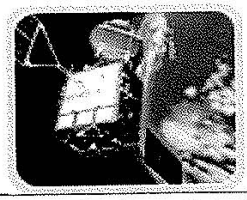
[Organizers] MEXT, JAXA and co-host organizations

- Past co-organizers: Government entities of Mongolia, Malaysia, The Republic of Korea, Thailand, Australia

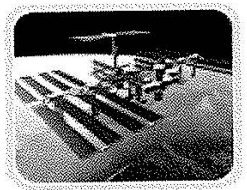
Working Groups



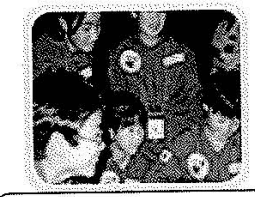
Earth Observation



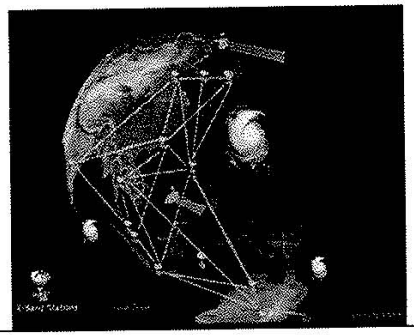
Communication Satellite Applications



ISS



Space Education & Awareness

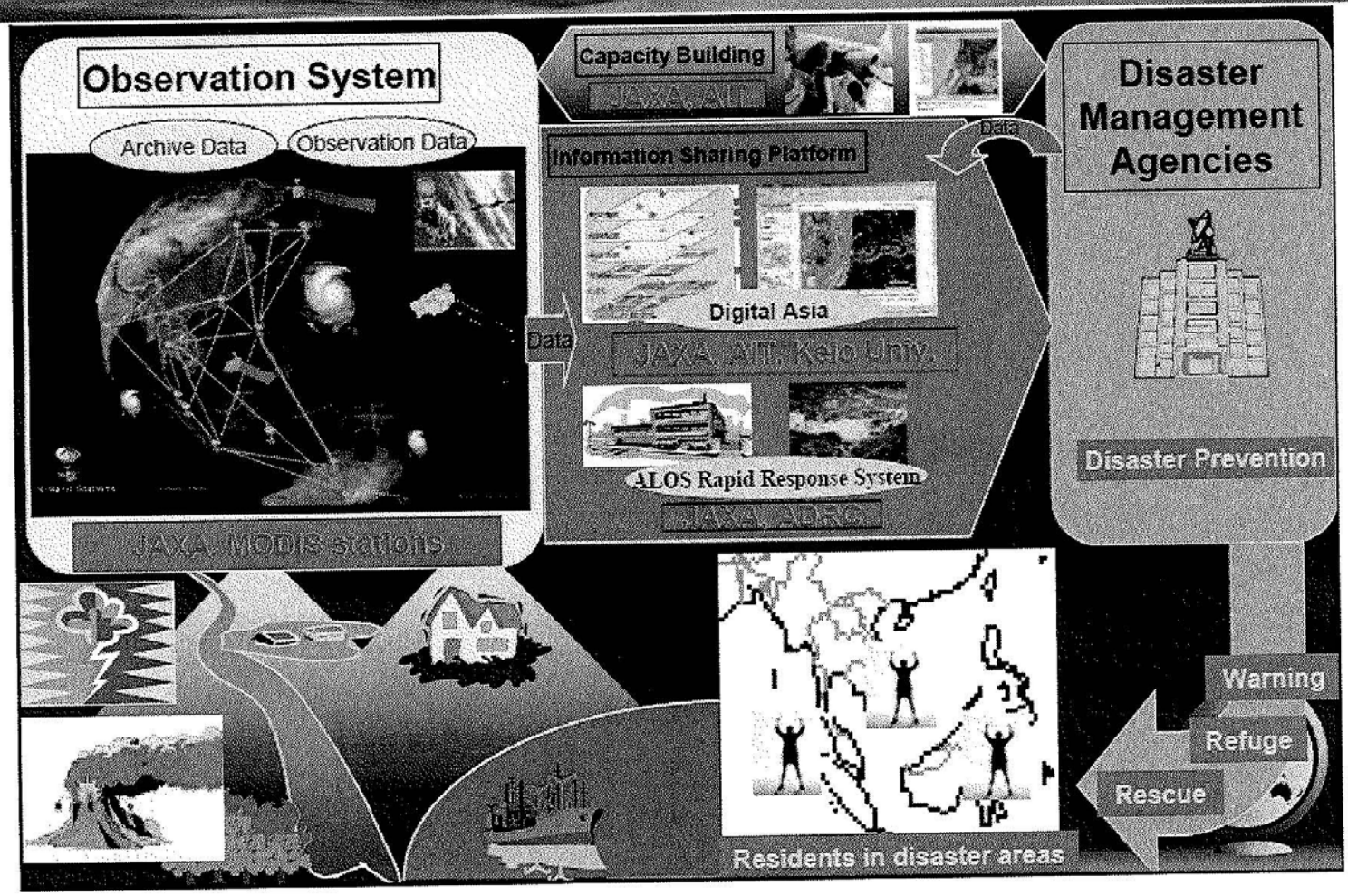


Sentinel Asia Project
establishing Disaster Management Support System

The 9th Session of APRSAF (APRSAF-9)
March 2003 in Daejeon, Korea hosted by MOST&KARI

The 13th Session of APRSAF (APRSAF-13)
22-24 Nov. 2006 in Jakarta Indonesia RISTEK MEXT JAXA

STEP 1: Establishment of Sentinel Asia (2006-2007)



Joint Project Team :1st Mtg. Feb 2006 @ Hanoi, Vietnam
2nd Mtg. Jun 2006 @ Bangkok, Thailand

Project Office in Bangkok
: to be opened in Jun 2006

Session 6

Legal Issues Arising from Space Exploration & Exploitation

LEGAL ISSUES ARISING FROM SPACE EXPLORATION AND EXPLOITATION

By

Dr. Visoot Tuvayanond[*]

Introduction

Ever since the dawn of Space age, when the first man-made satellite, Sputnik 1, was launched into the earth orbit by the USSR in October 1957, Space technology has been developing rapidly, while new discoveries and inventions have never ceased to be made, all of which have given rise to a myriad of new and unchartered activities of Mankind in the Outer Space. Neither has international Space law, customary and conventional, enshrined in international treaties and relevant UN resolutions ever ceased to evolve, but not fast enough to accommodate new development of Human's activities in Outer Space. Hence, the innumerous legal issues which are yet to be resolved, that this study professes to identify and expound.

Legal Issues Relating to the Delimitation of the Boundary between Air Space and Outer Space

The first and foremost unresolved classical legal issues that most literatures on Space law seldom fail to address are the definition of the Outer Space and the determination of where air space ends and Outer Space begins. Lots of academic attempts have been made to define such boundary, but in vain. Only the ceiling of a conventional aircraft flight, *i.e.* the outer limit of effective aerodynamic lift[1], used to receive a wide spread support but has eventually become obsolete on account of the development of new technology that has elevated the ceiling of the conventional aircraft flight to a much higher altitude by the invention of the aircraft with space faring capability. Although this issue remains unresolved, in international law the lowest altitude of a stable orbiting satellite *criterion*[2] or the perigee approach whereby the upper limit of territorial airspace is situated at the lowest perigee[3] of an orbiting satellite seems to come closest to the general acceptance by States[4]. It sets the limit at approximately between 50 to 60 miles[5]. Failing a better solution, it has more or less been *de facto* adopted in the prevailing State practice as makeshift *criterion* for the delimitation of the boundary between airspace and Outer Space[6]. This

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[*] Ex-ambassador to Portugal; Lecturer of International Law at the University of the Thai Chamber of Commerce Law School, Bangkok, Thailand.

[1] Which is normally at the altitudes of approximately 12-20 miles but not exceeding 25 miles.

[2] The horizontal line where an object traveling at 25,000 feet per second loses its aerodynamic lift and centrifugal force takes over.

[3] The "perigee" is the point in an elliptical orbit where and when a satellite is closest to the earth's center (as opposed to the "apogee", which is the point in such orbit where and when the satellite is farthest from the center of the earth.).

[4] Cf. UN Secretariat Background papers on "The Highways of Air Space and Outer space Over Asia", A/AC.105/C.2/7/Add.I; and Prof. Sompong Sucharitkul, "The benefits of space activities for Asian countries", Proceedings of Regional Meeting of the American Society of International Law on International Problems within the Pacific Rim, p. 3.

[5] Which are inclusive of the stratosphere and ionosphere.

[6] Cf .Prof. Jaturon Thirawat, Textbook on Space Law

provisional *criterion* could have crystallized into a *lex lata*, hadn't it been for the invention of the X-15 and a rocket-plane, like "Space-Ship-One"[7], that has rendered this emerging principle of Space law somewhat moot, if not obsolete altogether. The fact that X-15 and Space-Ship-One are hybrid crafts, which possess the characteristics of both aircrafts and space-crafts. speaks for itself that it has been implicitly recognized by the World community that the outer limit of an airspace or the lowest limit of Outer Space could be below the lowest perigee of an orbiting satellite [8], as the highest altitude, up to which X-15 and SpaceShipOne can ascend is approximately 47 miles, and the ceiling of their flight is qualified as sub-orbital[9]. These legal issues remain, therefore, in the legal limbo that could under various situations entail several delicate legal and practical problems regarding the liability of launching States and insurance companies, the liability regime for an aerospace object or space-craft in airspace being absolute, whereas in the Outer Space the liability is relative. The determination of the legal demarcation between air space and outer space is of vital importance for Space activities, because although it is nowadays a *fait acquis* that national and private activities in Outer Space might be undertaken by non-governmental entities, the Outer Space Treaty provides that the responsibility for such activities rests with States and that States are still required to authorize and continually supervise activities in Outer Space, national and private alike, undertaken by non-governmental entities[10]. These principles also reflect customary international law and thus legally bind all States.

New inventions and discoveries of Outer Space activities of Mankind have also given rise to a large spectrum of other legal issues, *inter alia*:

Legal Issues Relating to the Distinction between Spacecraft and Aircraft

Coming up next are the legal issues relating to the distinction between spacecraft and aircraft which may seem to be banal but can, in fact, have far-reaching consequences, ensuing from the invention of the hybrid crafts that have the characteristics of both aircrafts and spacecrafts, like X-15, and the rocket-plane, like "Space-Ship-One", Space Shuttles, and aircrafts with space faring capability. These new inventions have reactivated the problem of definition of an aerospace object or spacecraft which is at issue at this point in time in COPUOS. Questionnaires on the definition of an aerospace object or spacecraft and its applicable law, have been distributed to member countries for comments.

For Thailand, the answers to such questionnaires should be that the hybrid craft that possesses the characteristics of both aircraft and spacecraft should be qualified as aerospace object or spacecraft only insofar as its mission is in Outer Space, and its navigation in air-space of subjacent State is a mere innocent transit to and from Outer Space prior to and after its mission in Outer Space. Otherwise, aircraft with Space faring capability, whose mission is the terrestrial transportation of people and cargos from one place to another on Earth just like any conventional aircraft and not in Outer Space, will be entitled *ipso jure* to claim the right of transit through air-space of other States without their prior consent, when a transit through airspace of other States is permissible for aerospace object or spacecraft because, under Space Law, the

[7] Which was successfully launched on June 21st and landed safely. The second launch took place on October 4th and safely landed on California's Mojave dessert in Western U.S.A. (BBC Oct. 4th, 2004)

[8] Which is between 50 to 60 miles above the surface of the earth.

[9] Meaning "below the orbit"

[10] Cf. Article VI of the Outer Space Treaty.

exploration or exploitation of Outer Space has to be done in the common interests of Mankind and is subject to the specific legal regime under Space Law, whereby the damages caused by aerospace object or spacecraft entail a liability of its launching States. Whereas, aircraft with Space faring capability, civil and military alike, right from its experimental to the exploitation phases is primarily designed to be used for the personal or national interests of its operator. Hence, the liability of only its operator for damages arising there from, and the desirability of its submission to Air Law, which requires prior approval for the over-flight in another State's air space, rather than the Space Law which does not require such a prior approval for an over-flight of the subjacent State. Therefore, aircraft with a space faring capability should not be categorized as aerospace object or spacecraft, and the legal regime applicable to the flight of aerospace object or spacecraft should not differ according to whether it is located in the airspace or Outer Space, because:

Primo, Outer Space activities are inherently dangerous right from the ignition stage of the launch of aerospace object or spacecraft. Hence, the impetus for the liability of launching States to commence at that very moment, otherwise the liability of launching States for the damages would not begin before the Space object or spacecraft reaches the realm of the Outer Space, in which case there will be a *lacuna* regarding the risks that subjacent States have to run during an over-flight of the aerospace object or spacecraft, which could be serious. *A fortiori* when the danger of Space activities is greater while the flight of aerospace object or spacecraft is located in the airspace than in Outer Space.

Secundo, the objective of the regime of innocent transit to and from the Outer Space through the airspace of other State, which is a customary international norm[11], therefore legally binding *erga omnes*, would be defeated and neutralized because a legitimate Outer Space activities project, which is conceived and executed in the common interests of Mankind could be easily thwarted by any State merely by prohibiting the over-flight of the aerospace objects or spacecrafts under such a project, given that after the take-off, before attaining the lower limit of Outer Space and after the re-entry into the Earth atmosphere, before reaching the ground, aerospace object or space-craft will always have to transit through the airspace of more than one State. Besides, since the mere fact of being in an airspace *en route* to and from the Outer Space does not convert the aerospace objects or spacecrafts into aircrafts, the legal regimes applicable to aerospace objects or spacecrafts at their take-off and at their landing phases should be identical. The Air Law is applicable only to aircrafts, whereas aerospace objects or spacecrafts are subject to the Space Law only. Air Law could not, therefore, be applied to the aerospace object or spacecraft in transit through the airspace of the subjacent State. The salient difference between the legal regimes for airspace and Outer Space is that the airspace is under the sovereignty of its subjacent State, but Outer Space, being *res communis humanitatos,* is not under the sovereignty of any State. So while prior permission is the prerequisite for a transit through airspace of the subjacent State, no such permission is required for the navigation in Outer Space over and above the subjacent State, where the principle of "Freedom of Space" prevails. There are many practical reasons why a clear legal distinction between commercial aviation flights and

[11] As Judge Manfred Lachs of the International Court of Justice observed: The first instruments that men sent into outer space traversed the air space of States and circled above them in outer space, yet the launching States sought no permission nor did the other States protest. (The fact that such a transit has always been taken for granted without protest of any States obviously reflects the *opinio juris sive necessitatis* that there exist a customary international law that permits such an over-flight.)

commercial space flights should now be properly determined in wake of the impending advent of space tourist activities, particularly involving the suborbital flights, which is one of the topics to be dealt with hereinafter.

Definition of the "Launching State"

The definition of the "launching State" is another legal issue that needs to be addressed at this juncture, because although there has been a wide support in State practice that a State is deemed to be a launching State where it has had some involvements in the launching of a Space object, and it is clearly defined in the Outer Space Treaty and the Liability Convention as a State that "launches or procures the launching of a Space object or the one from whose territory or facility a Space object is launched", the hybrid circumstances like in the case of Space-Ship-One, where there is the launch of a Space vehicle from another vehicle in airspace, have complicated the legal issues relating to the definition of the launching State and the applicable law for the launching stage of a Space vehicle. In effect, the fact that the Space craft of this type is launched from an aircraft while traversing the air-space of many States has induced an international jurist[12] to maintain that the most appropriate way of regulating such flights would be to apply air law to the combined vehicle (the mothercraft, White Knight, and the Space-craft, Space-Ship-One, before the launch) and then apply Space law to Space-Ship-One from the moment it is launched until its return to earth. While the mother-craft, White Knight, would always remain subject to air law. As appealing as it may sound, such a view is not admissible *in toto*, because its legal consequence could impede the launching of this type of space vehicle, owing to the fact that before attaining the altitude, where the Space-Ship-One could be appropriately launched from its mother-craft, the combined vehicle will have to traverse the air-space of several States which may under air law prohibit an over-flight of their territories to impede the launch of Space-Ship-One. Therefore the combined vehicle should be subject to the Space law, both in regard of the liability and the right of transit regimes, but the mothercraft, White Knight, itself, after the launch of Space-Ship-One, should no longer be subject the Space law in regard of the liability regime, because the inherent danger of Space activities would then cease to exist, and should, in regard of the over-flight, be subject to air law.

Military Use of Outer Space

The incessant and rapid developments of Space weaponry technology have also given rise to the delicate and sensitive legal issues relating to military use, weaponization and militarization of Outer Space, as to whether such operations are in keeping with the prevailing Space law given that the principle of peaceful use of Outer Space is integrated *expressis verbis* by the United Nations in the "Outer Space Treaty**"** (the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies) and the Antiballistic Missile Treaty that bans space-based weapons, and by the Committee on the Peaceful Uses of Outer Space (UN/COPUOS). *A fortiori* when the 1996 Clinton administration policy advocated pacific use of Outer Space, including spy satellites' support for military operations, arms control non-proliferation pacts, and when many members of the US Congress are of the opinion that "Space should be sanctified and no weapons ever put in Space", and Arthur J. Goldberg, US Ambassador to the UN, has also addressed to the United

[12] See Bin Cheng, International Responsibility and Liability for Launch Activities, 20:6 Air & Space Law 15.

Nations General Assembly on December 17th, 1966, that our first responsibility as governments is clear: "We must make sure that Man's earthly conflicts will not be carried into Outer Space". Yet notwithstanding such a solemn officially declared policy of the United States, according to TIM WEINER[13], the United States Air Force plans to start putting weapons in Outer Space, possibly offensive as well as defensive, and the United States has already spent billion of dollars developing Space weapons and preparing the plans to deploy them. Besides, a new presidential national-security directive that would run counter-current to the 1996 Clinton administration policy is also being sought. Virtually despite the persistent efforts to make Outer Space a demilitarized zone, the military uses of Outer Space by practically all Space Powers have been substantial since the beginning of the Space age. And indeed since before the beginning, as United States interest in the military use of Outer Space dates back to the end of the World War II[14]. An example *par excellence* of such a trend is the US use of the PPS (Precise Positioning Service) provided by the P-Code[15] of the Global Positioning System (GPS)[16] which accounted for the uncanny accuracy and precision with which US satellite guided-missiles could hit their remotest targets miles and miles away, which has given the US military interventions in Iraq the code name of "Shock and Awe" Operation, that has vested United States Air Force with the unrivalled military might. Besides, the use of Reconnaissance or spy Satellites, which provides the Space Powers with an infinite strategic advantage over Non-Space Powers is nowadays common place. Moreover, under the doctrine set forth in a United States Air Force document entitled "Counterspace Operations" the US Air Force claims the right to attack enemy satellites or ground stations, or satellites and ground stations of neutral third countries that are being used by the enemy nations. In effect, the US Air Force declares *expressis verbis* that it is obliged "to secure the Outer Space to protect the nation from attack" and seeks President George W. Bush's approval of the national-security directive that can move United States closer to fielding the offensive and defensive Space weapons. And although the United States has not yet reached the point of strafing and bombing from Space, it is contemplating those possibilities. Moreover, a new air force strategy, "Global Strike" calls for a military space plane carrying the precision-guided weapons armed with half a ton of the munitions. Global Strike connotes the capability to destroy command centers or missile bases anywhere on Earth. According to the Pentagon document the weapon called the Common Aero Vehicle which can strike anywhere from half - way around the world in 45 minutes is the type of the prompt Global Strike which is identified as a top priority for the US space and missile force.

Furthermore, apart from the United States Air Force's strive to build a nuclear-missile defense on Earth, the US has another program that would bounce laser beams off mirrors hung from Space satellites or a huge high-altitude barrage balloon redirecting the lethal rays down to the targets around the world. With new technology for a Space-based laser the US Air Force already has a potential weapon in Outer Space. In April 2006, the US Air Force has launched the experimental micro-satellite, called "XSS-11", with the technical capability to disrupt other

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[13] Former acting secretary of the US air force.

[14] Paul B. Stares, The Militarization of Space: U.S. Policy, 1945-1984 (Cornell 1985).

[15] Precision Code.

[16] A military space system operated by the US Air Force. The space segment of the GPS consists of a constellation of 24 satellites that broadcast precise time signals that aid position-location, navigation and precision-timing. The GPS has also spawned a substantial commercial industry with rapidly growing markets for related services. It is now a worldwide information resource supporting a wide range of civil, scientific and commercial functions, from air traffic control to the Internet. Its Coarse Acquisition Code or C/A Code is designed for non-military use and provides the Standard Positioning Service (SPS), which is used by most commercial operations.

nations' military reconnaissance and communications satellites. While another Air Force space program, nicknamed "Rods from God", aims to hurl cylinders of tungsten, titanium or uranium from the edge of Outer Space to destroy targets on the ground, striking at the speeds of about 11.600 kilometers an hour with the force of a small nuclear weapon. In April 2006, General James Cartwright, who leads the US Strategic Command, told the Senate armed services nuclear forces sub-committee that the goal of developing space weaponry was to allow the nation to deliver an attack very quickly with very short time lines on the planning and delivery, any place on the face of the Earth[17].

From the US legal standpoint, no treaty or law bans Washington from putting weapons of mass destruction in Space, because the US has, in 2002, already withdrawn from the Antiballistic Missile Treaty, which banned space-based weapons. The principle of peaceful use of Outer Space is thus being seriously challenged. The challenge for the World community and international lawyers in this matter is to come up fast with the plausible and pragmatic solution to such a precarious situation. Especially in the wake of the ever growing serious concerns of the United States about the struggle of some hardliner countries to acquire nuclear weapons and long range ballistic missiles technology[18] at any cost so as to become nuclear Powers which is seen as a threat to the World peace and security, which may prompt a recourse to the pre-emptive measures, that would have far-reaching consequences. North Korean testing of the long range ballistic missiles have already prompted Japan's warning that it might take the pre-emptive actions if and when there is a reasonable ground for Japan to feel imminently threatened[19]. It is to be feared that pending such solution deployment of Space weapons would risk provoking a Cold War era type of Space arms race at the expenses of World peace and security. Furthermore, if United States leads the way in flight-testing and deploying the anti-satellite (ASAT) weapons, other States will surely follow suit, because they have got too much to lose to allow United States to monopolize the supremacy in Space and have the sole rights to Space warfare.

Viability of Steadfast Non-appropriation of Outer Space Principle

Notwithstanding the provisions of the Outer Space Treaty (OST), which is the cornerstone of international Space law and the rock, on which all further principles and rules are built[20], that the Outer Space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation or by any other means"[21], and the presumption that this reflects a customary law principle evidenced by the practice of States since the launch of Sputnik 1. Formerly given that only three nations, the U.S., Russia, and China, have manned Space programs. Without a viable means to explore Space, sovereignty is unimportant: if it is too expensive to even consider building a moon colony, the legal issues relating to obstacles to celestial construction neither warrant nor are they worthwhile being

[17] For more details, Cf. BANGKOK POST, Friday, May 20, 2005, p. 13

[18] If India, which has now acceded to the status of a nuclear and Space Power, has recently developed long-range nuclear capable ballistic missiles (Bloomberg and TV5 Monde, July 8th, 2006) without provoking general concerns, it is only because India is not seen as a hardliner country and its foreign policy is not viewed as a threat to the World peace and security.

[19] Bloomberg and TV5 Monde of July 10th, 2006.

[20] The "OST" has been signed by 27 countries and ratified by 98, including all of the current space-faring nations.

[21] Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies ("Outer Space Treaty"), Article II.

raised. It is noteworthy, however, that in practice, ever since the adoption of the "non-appropriation" or no sovereignty principle, Space activities of Space farer and user nations have never ceased to raise legal issues relating to their compliance with such a principle, which has been increasingly challenged by the State practice especially in the contemporary era, where the notion of "no sovereignty" has been grievously undermined. *A fortiori* when the Moon Treaty(the Agreement Governing the Activities of States on the Moon and other Celestial Bodies) has neither been signed nor ratified by the major space-faring powers and indeed even claimed by some authors to be widely considered as being defunct. Besides, the notion of non appropriation is also being increasingly eroded by allowing for a system where part of Outer Space is allocated to a particular State to the exclusion of other States. For instance, the ITU[22], in addition to regulating radio spectrum, is *de facto* responsible for the allocation of orbital slots in the geostationary orbit ("GEO") to States, which is akin to allocating a quasi property right, as there have been circumstances where a State, after being allocated the orbital slots in the GEO, has been allowed to lease them to other States[23]. The erosion of the non appropriation principle is further aggravated by the imminent advent of a large-scale private Space tourism and celestial resources mining.

In regard of Space tourism, although as Glenn Harlan Reynolds puts it "the very term "Space tourism" invited giggles just a few years ago", the pioneer Space tourism was triggered off in April 2001 when an American national, Dennis Tito spent 6 days in the Russian section of the International Space Station ("ISS") and in April 2002, a South African, Mark Shuttleworth, became the World's second Space tourist, who was launched onto the "ISS" by Russian Space Agency[24], which virtually set Space tourist business afoot. It was the invention and 2 successful launches of low cost reusable Space vehicles, Space-Ship-One, that substantially reduced Space flight fares from twenty million dollars to the affordable amount of $275,000 per head, which really changed the public perception of commercial Space travel from a mere fantasy to a possibility, which will soon become a reality. Such an evolution of Human's activities in Outer Space has rendered Space tourism a viable commercial venture. In consequence where-of, over seven thousand people have reportedly already signed on to reserve a $275,000 seat on these flights, which are scheduled to commence in 2008. Several companies are developing the capability of providing civilian space tourist flights, particularly suborbital ones[25].

With this new development, permanently occupied Space stations and the prospect of human settlements on celestial bodies are quite foreseeable. Consequently, Japan plans building a manned lunar base in 20 years**.** U.S., China, India, and the EU all to establish manned lunar bases. And as Space tourism activities develop, there will surely be the demand for the constant presence of tourists in orbiting hotels as well as on the moon and other celestial bodies, thus necessitating the construction of celestial hotels. Hence, the wide spread projects and preparation for the development of Space tourism infrastructure and over one hundred co-orbital hotels and the daily scheduled lunar flights to a series of lunar orbit and lunar pole

[22] International Telecommunications Union.

[23] Like the case of Tonga.

[24] Who each reportedly paid up to twenty million US dollars to engage in the ultimate tourist adventure.

[25] Chicago Journal of International Law Summer 2005 Articles Symposium: Issues in Space Law "Up, Up and . . . Back: The Emergence of Space Tourism and Its Impact On The International Law Of Outer Space", Steven Freeland.

hotels[26]. Naturally, the investors in so colossal the projects would need reliable and concrete guarantees for their property rights, which can only be ensured by an appropriate legal framework, that the prevailing Space Law still lacks on account of the no-sovereignty principle, given that the respect of property rights can only be ensured by municipal law and enforceable through the Executive and Judicial Powers which are unconceivable in the absence of national sovereignty, because without the sovereignty no jurisdiction can be imposed, no laws can be applied so investment cannot be secured. Of course, property rights on the hotels and other constructions themselves are already protected by general principles of law and jurisdiction can be exercised in hotels and other celestial constructions through the system of registration[27] but such protection and exercise of jurisdiction can not be extended to cover the sites, or the areas upon which Space tourist hotels or other structures would be constructed, which do not belong to the owners of the hotels and other constructions. Such protection is for a stronger reason needed in wake of the prospect of human permanent settlements or colonies on celestial bodies. The failure of Space law to provide an adequate legal security for investments and ventures in Space will be a strong inhibitor in this highly lucrative commercial Space exploitation.

With regard to celestial resources mining[28], the opportunities for mining celestial resources are incredible. The moon is a large source of Helium-3 (He-3), a rare isotope ideal for certain forms of nuclear energy. He-3 is very rare on Earth, and is worth US$15 billion per ton. Even more astonishing are the Class-M ("M" for metallic) Near Earth Asteroids (NEAs). NEAs are relatively close to Earth compared to Mars, and occasionally even closer than the moon. They contain metals in concentrations far in excess of those of the richest mines on Earth. Even the smallest NEA contains more metal than has been mined in the whole of human history. The market value of 1 asteroid is almost US$5 trillion. The principal and prime impediment to Space mining has always been that although it is technically possible, from the cost-effectiveness standpoint, it has not quite been economically viable, because the cost of launching a rocket into orbit exceeds the value of the gold that could be retrieved from Space mining in one trip[29] and, therefore, not feasible.

However, now that the advances in materials science have given rise to the invention of the incredible Carbon Nanotubes[30], which is a technological breakthrough that will revolutionize the exploration and exploitation of Outer Space both for Space tourism and Space mining by making it possible to construct a Space Elevator, which used to be regarded as mere fantasy in science fiction. The production of Carbon Nanotubes has moved the Space Elevator from the realm of science fiction to reality. Theoretically, to build the Space Elevator, a spool of ultra-lightweight, super-strong "Carbon Nanotube" has to be taken to the GEO and unwound. One end would lower towards Earth, while the other end would trail into Space as a counter balance. As long as the center of the mass of the entire system was in GEO, the whole cable would

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[26] *Ibid.*

[27] Under the Outer Space Treaty, "jurisdiction and control" over a space object (which is inclusive of all celestial constructions) and its personnel "while in outer space or on a celestial body" is vested in the State that registers that object pursuant to the Registration Agreement.

[28] For the stance of Thailand in this regard Cf. Jaturon Thirawat, "The Stakes of Third World Countries in the on-going Development of the Space Law and Activities" , Proceedings of the 1st Asian Space Conference, 22-25 November 2004, Geo-Informatics and Space Technology Development Agency (GISTDA),Bangkok, pp.248-253.

[29] Because the costs to orbit currently run in the thousands of dollars per pound.

[30] Carbon nanotubes are similar to diamond or graphite, comprised only of carbon atoms. Carbon nanotubes are sheets of carbon atoms, arranged in hexagons, and rolled into ultra-lightweight, super-strong material cylinders.

remain stationary and would hang from the orbit. A high -speed train would be mounted to the cable and ferry people and materials to the orbit. A Space station would be built at the GEO, providing easy access to other spacecraft[31]. NASA expects the Space Elevator to be built within 35 years, whereas the LiftPort Group has committed to complete the construction of Space Elevator within 13 years[32]. Although the price of developing and building Space Elevator is estimated to be as high as US$10 billion, given that the cost of the ISS has exceeded US$60 billion and the cost of the Apollo program in today's dollars is over US$150 billion, the building and development of the Space Elevator is much more cost-effective and economically viable.

If up to now, none of the Space tourism and Space mining projects have ever been truly off the ground in spite of their technical possibility, it is only because such ventures have not yet been quite economically viable, therefore not yet feasible, given that commercial exploitation of Outer Space is extremely expensive: the launching to Low Earth Orbit (LEO) at an altitude of 100 to 300 miles would cost approximately US$2,000 to US$15,000 per pound, depending on the type of the rocket used; the fuel price for 200 pounds of person, air, food, and water is approximately US$400,000 to US$3 million; the launching to the Geosynchronous Earth Orbit (GEO) at the altitude of 22,300 miles costs US$60,000 per 1 pound on a rocket, or $200,000 per pound on the Space Shuttle. Thus for 200 pounds, the cheapest ticket available to GEO is almost $12 million[33].

Although the invention of a low cost reusable hybrid spacecraft, Space-Ship-One, has substantially reduced the costs of Space flights, and made sub-orbital Space tourism a viable commercial venture, this new Space technology has still not yet been developed enough to be used for Space mining. These constraints are very prohibitive and put Space exploration and exploitation well out of reach of most nations. With the Space Elevator in place, the costs of getting into Space will be drastically reduced to only a little more than US$ 2,000 for lifting people past GEO, and with travel costs at only US$10 per pound on the Space Elevator, the asteroid mining and He-3 collection become enormously lucrative and profitable.

Since formerly only a handful of nations, *viz*, the U.S, the EU, Russia, and China, had manned Space programs, and without viable means to explore and exploit Space, sovereignty had little importance in immediate future and if it was too expensive to consider building a colony on the moon, the legal obstacles to construction on celestial bodies neither warrant nor worthwhile being dealt with in depth. That was why the issues relating to the sovereignty and non-appropriation principle have thus far never been seriously raised.

Nowadays, every country is well aware that, with the Space Elevator in place, the economic barriers to the celestial resources mining and to the construction of celestial hotels will be effectively removed, and most nations will thus have the ability to reach Space and establish temporary or even permanent settlements on the moon and other celestial bodies. All such ventures necessitate appropriate infrastructure, which will require the possibility to appropriate some part of the celestial bodies, failing which no investments in celestial hotels operation and Space mining will ever be adequately protected to be worthwhile.

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[31] Hastings International and Comparative Law Review, Winter 2005, OPENING THE PANDORA'S BOX OF SPACE LAW, Paul Tobias.

[32] Ibid.

[33] Ibid.

It is, therefore, obvious that a steadfast non-appropriation of Outer Space principle is not viable and will eventually need to be modified.

Conclusion

In light of the above, it may be concluded that a number of Space principles, especially the non-appropriation principle and military use of Outer Space may need to be reviewed to accommodate some new developments and their consequential emerging needs. The fact that it has been hinted that issues of the revision of Space law principles should figure in the agenda of the on-going UN/COPUOS round of talk, is very indicative of this new tend in the international Space law which seems to already be a *fait accompli*. After all, new discoveries and breakthrough technologies that open new areas of exploration and exploitation always result in new laws to deal with new problems.

OBSERVATIONS ON LEGAL ISSUES ARISING FROM SPACE EXPLORATION AND EXPLOITATION

By

Chia-Jui Cheng*

The establishment of fundamental principles governing human activities in outer space is a concern dating from the very beginning of the exploration and exploitation of outer space. Such principles are reflected, *inter alia,* in the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies (the 1967 Outer Space Treaty), which is widely considered the world's outer space "constitution" and the foundation of the international legal regime governing all outer space activities. Nevertheless, these principles do not cover previously established areas of space activities and cannot serve as new norms regulating new legal issues arising from exploration and exploitation of outer space.[1]

Generally speaking, outer space activity may be seen as oriented toward military, economic, commercial, and scientific utilization and competition. Except for potential military uses and weaponization of outer space pursued by big military powers, most other areas of space activities have, in recent years, tended to be commercialized within the framework of national projects related to launch services, satellite communications, satellite remote sensing, and satellite navigation services. A constant theme in the pursuit of all these activities is the web of legal issues to be regulated by new norms of space law.

However, increasing uses of outer space are leading to new legal issues to be regulated, such as new attempts to use outer space for military purposes, legal issues in the use of the moon and other celestial bodies, legal issues in the various forms of commercial use of outer space – for example, the applicable law of commercialized space contracts and the space debris problem --, and the scientific share of outer space information, data and imagery. All have to be regulated through international and national legislation.

Taking into account of the potentially serious consequences of these activities, some legal issues generated by the exploration and exploitation of outer space urgently need to be addressed to strictly implement already existing law-making multilateral treaties, and other new conventions and agreements also need to be formulated to prohibit any possible abusive uses of outer space.

1. To ensure the peaceful use of outer space, a principle contained in Article IV of the Outer Space Treaty openly prohibits (a) the placement "in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction," and (b) the militarization of celestial bodies, so that they could continue to be used by all States

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[1] For a recent discussion on legal issues arising from the exploration and exploitation of outer space, see Jkhu, R., "Legal Issues Relating to the Global Public Interest in Outer Space", October 2005, at http://www.cissin.und.edu/papers/files/jakhu.pdf. (2006/7/28)

"exclusively for peaceful purposes." However, before executing space military projects for certain military powers, the United Nations needs to adopt positive legal measures that draw a clear line of demarcation between the peaceful uses and military uses of outer space. Even more important, present space law makes little provision for verification or inspection procedures for controlling the military use of outer space. Other existing treaties, including the Outer Space Treaty and the Limited Test Ban Treaty, provide little in the way of an inspection or verification apparatus. Policy and legislative options regarding possible deployment of further military capabilities in outer space is not a State matter *per se* but a proper concern of international society as a whole.[2]

2. In the area of economic and commercial uses of outer space, there is concern because commercial activities and legal issues are increasing. Space telecommunications, remote sensing, launching, transportation (tourism) and communication and navigation probably all involve more new legal issues than before because of privatization and commercialization combined with new inventions in space technology. Some of the problem areas are as follows:

First, although the law of space telecommunications is already in operation, new legal issues have emerged with increased privatization of space telecommunications and other relevant legal issues remaining to be solved. These issues include space commercial contracts; insurance matters; liability of launching and contracting parties, intellectual property protection; aeronautical public correspondence (APC),[3] etc.

Secondly, new legal issues are arising from the remote sensing of the earth by satellites. These are mostly concerned with the problem how to draw a clear demarcation line between civil and military uses of remote sensing as well as the equitable sharing of data from remote sensing operations.[4] Sometimes, a civilian satellite is used, in part, by (a) state(s) for military reconnaissance or (arms) verification purposes. Which rules are to be covered by such activities?

Thirdly, contractual issues arising in relation to commercial uses of outer space are involving various aspects of private international law, depending upon the characterization, choice of jurisdiction and choice of law. It seems to us that the principle of choice of law by contracting parties is still that of "preview", namely, a space contract is governed by the law chosen by the parties. The parties' agreement on this choice must be express or must be clearly demonstrated by the terms of the contract and the conduct of the parties, viewed in their entirety. If there is no agreement, the principle of "the most closely connected factors" has to be applied by competent court and arbitral tribunal.

Fourthly, despite the fact that space technology has always been one of the most advanced technical areas, and outer space activities are, in fact, the fruit of intellectual creations, it is only in recent years that intellectual property protection in connection with outer space

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[2] See, Policy and Legislative Options for Parliamentarians Regarding Possible Deployment of Further Military Capabilities in Outer Space, prepared by Institute of Air and Space Law, Faculty of Law, McGill University, Montreal, Canada, June 2005.

[3] APC is a service offered on board aircraft by airlines, enabling passengers to use a variety of (private) communication, e-mail and internet services. See Haanappel, loc. cit., p. 159.

[4] Reijnen, G.C.M., "Remote Sensing by Satellites and Legality", in N.M. Matte and H. DeSaussure, eds., Legal Implications of Remote Sensing from Outer Space, Sijthoff/Leyden, 1976; Haanappel, P.P.C., The Law and Policy of Air Space and Outer Space – A Comparative Approach, Kluwer Law International, The Hague/London/New York, 2003.

activities has attracted wider attention.[5] Private and commercial activities in the areas of remote sensing from space, direct broadcasting and research and manufacturing in micro-gravity environments are all related to the application of intellectual property rights with wide implications within the framework of international intellectual property law. However, the main body of current international space law contains no provisions expressly dealing with intellectual property rights. Space intellectual property rights arising from the exploration and exploitation thus have to be formulated. In April 2004 the International Bureau of WIPO published an issue paper on intellectual property and space activities which may provide some clues to the problems. According to the paper, issues have to be clarified include these:

1) Article 5ter of the Paris Convention for the Protection of Industrial Property provides that there is no infringement of the rights of a patentee in the case of "the use on board vessels and the use of devices forming the subject of the patent in the construction or operation of aircraft or land vehicles of other countries of the Paris Union, or of accessories of such aircraft or land vehicles, when those aircraft or land vehicles temporarily or accidentally enter the said country." This principle has to be further clarified.
2) Whether Member States of WIPO should specify that the laws applicable to inventions in the territory of a country will also apply to spacecraft registered by (under jurisdiction of) the said country.
3) Whether there should be standardization of contractual clauses on the protection of inventions and confidential information created or used in international cooperative agreements between space faring nations.

In addition we find certain doubts in relation to space intellectual property rights and the problem of the applicability of national/regional intellectual property law in outer space and enforcement of intellectual property rights in outer space; the role of arbitration and mediation and synergy with other international obligations and morality; and the interpretation of Article 5ter of the Paris Convention.

Fifth, space transportation for tourism and other purposes requires "a new conventional regime for the space carrier's liability towards passengers and shippers".[6] Transportation to and from the outer space may engender both public and private law problems. Regulations for the liability of a carrier in aerospace travel and the damage to third parties on the ground need to be re-defined and re-formulated.

Sixthly, the legal aspects of global navigation satellite systems (GNASS), or communication navigation and surveillance satellites for air traffic management (CNS-ATM), which are involved in satellite systems, earth stations and mobile 'stations' on earth, in the air or on the ground, have never been very conclusive.[7]

Seventh, the extraterritoriality of national space law issues presents problems similar to those of economic and commercial issues which have arisen in the context of public

[5] For details, see WIPO, Intellectual Property and Space Activities, Issue paper prepared by the International Bureau of WIPO, April, 2004.
[6] Haanappel, P.P.C., loc. cit., p. 162.
[7] Ibid., pp. 163-4.

international law. Particularly, the United States seeks to apply its laws -- for example, the United States Export Administration Act -- outside its territory in a manner which may precipitate conflicts with other states. In 2000 Prof. Jakhu analyzed the impact of these problems on the communications satellite industry.[8] The European Community has taken a strong position against the US approach.[9] In outer space commercial activities, whether the United States is permitted to extend the scope of its legislative jurisdiction based on "nationality of technology" to other foreign nationals is still subject to considerable debate and is plagued by a situation of uncertainty.[10]

Regarding the extraterritoriality of national legislation in international society, the imposition by space powers on the ability of other members of international society to develop their own space science and technology is another onerous and hegemonial act causing new legal consequences in international law. Whether it is possible for a group of foreign powers to restrict the ability of other sovereign States to develop their own, for example, launching capability is a question of international law. The Missile Technology Control Regime (MTCR) formulated by a series of guidelines among Canada, Germany, France, Italy, Japan, the U.K. and the U.S. "informally agreed to a set of policy guidelines regarding the control of proliferation of missile technology".[11] Although MTCR was not designed to restrict access to technologies necessary for peaceful economic development, in fact, it has, in certain cases, been used to create hurdles to impede peaceful aerospace programs or international cooperation in such programs. India has been a victim of MTCR in the past.[12]

Lastly, launching services are concerned, in most cases, with the contractual relationship between two contracting parties of State-owned companies/national space agencies.[13] At the moment, the legal regime is formulated by bilateral agreements under the control of national legislation[14] and a new multilateral convention is needed to define clearly the rights and obligations of launching and launched parties.

3. In the area of scientific uses of outer space, the problem is that developing countries may not be able to share scientific data and other relevant materials. Developing countries should have the rights to access to the weather satellite data "on reasonable cost terms", for example. New regulations regarding the equitable sharing of scientific data from outer space activities have to be further worked out through competent international

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[8] See, Jakhu, R. and Joseph, W., "The New United States Export Control Regime: Its Impact on the Communications Satellite Industry," XXXV, Annals of Air and Space Law, 2000, pp. 157 and seq; Lihani, D., "Shifts in U.S. Export Controls Force Changes Upon Commercial Satellite Manufacturers and Space Launch Providers," Colloquium on the Law of Outer Space, 1999, pp. 208 et seq.; Meredith, Pamela L. and Fleming, Sean P., "U.S. Space Technology Exports: The Current Political Climate," 27 (1) Journal of space Law, 1999, pp. 35 et seq.

[9] It declared that: "US claims to jurisdiction over European subsidiaries of US companies and over goods and technology of US origin located outside the US are contrary to the principles of international law and can only lead to clashes of both a political and legal nature. These subsidiaries, goods and technology must be subject to the laws of the country where they are located." See Shaw, M., International Law, 5th edition, Cambridge University Press, 2003, p. 618.

[10] Lowe, V., "Jurisdiction" in International Law, edited by Malcolm D. Evans, Oxford University Press, 2003, p.346-7; Brownlie, I., Principles of Public International Law, Sixth Edition, Oxford University Press, 2003, pp.306-308.

[11] See, Jakhu, loc. cit., p. 30.

[12] Ibid., p. 32.

[13] Relating to legal issues of launch services, see van Fenema, H.P., The International Trade in Launch Services, Doctorial Thesis, International Institute of Air and Space Law, Leiden University, p. 1999.

[14] See, the U.S. 1984 Commercial Space Launch Services Act, 49 U.S.C., 2601, as amended in 1988 and 2004.

organizations such as UNESCO[15] and the World Meteorological Organization (WMO). The former is concerned with the development of informative date collected from and distributed by satellites, while the latter is making increasing contributions to the development of the Global Observing System (GOS) of World Weather Watch (WWW), as well as to other WMO-supported programmes and associated observing systems.[16] This could provide improved data, products and services continuously, from both operational and R & D satellites, and facilitate and promote their wider availability and more meaningful utilization around the globe.

In all, legal issues of the exploration and exploitation of outer space are, at the moment, facing many new legal questions and problems. The peaceful use or military use of outer space is an urgently unsolved legal issue, while for the commercial use of outer space need the creation of a new legal regime is needed. Moreover, the conflict between space powers of and developing countries itself needs to be addressed by the creation of a new legal regime based on multilateral compromise and consensus.

[15] For example, Convention relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite, was drafted and signed by the UNESCO on 21 May 1974 at Brussels.
[16] See, WMO at http://www.wmo.ch/web/en/wmo-programmes.html (2004/10/3).

COMMENTS ON THE DISCUSSION PAPER "LEGAL ISSUES ARISING FROM SPACE EXPLORATION & EXPLOITATION"

by

Robert Beckman[*]

First, I would like to congratulate Dr. Visoot Tuvayanond for his excellent paper. It is very well-written and it very clearly highlights the major issues arising from future space exploration and exploitation.

Given the time permitted, I will limit my comments to a discussion of two legal principles discussed in Dr Visoot's paper which apply to the oceans as well as to outer space: (1) military activities and the principle of peaceful uses of outer spaces; and (2) the principle of non-appropriation. In my discussion of the principle of non-appropriation, I will also discuss whether it can be argued that the natural resources of the moon and celestial bodies is governed by the principle of common heritage of mankind, and if so, how that principle may be interpreted in by nations seeking to engage in the exploitation of natural resources in outer space.

Military Activities and the Peaceful Use of Outer Space

I share Dr Visoot's concern about the increase of military activities in outer space. However, I must point out that the military activities he describes in his paper are not inconsistent with the principles set out in GAR 1962 and in the Outer Space Treaty. Military activities are not mentioned in the body of GAR 1962. Two limitations on military activities are set out in Article IV of the Outer Space Treaty. First, States Parties are prohibited from undertaking activities in outer space with nuclear weapons or any other kinds weapons of mass destruction (WMD). Second, the Moon and other celestial bodies are to be used exclusively for peaceful purposes, and the following military activities are forbidden on the moon and other celestial bodies: (a) the establishment of military bases, installations and fortifications; (b) the testing of any types of weapons; and (c) the conduct of military maneuvers on celestial bodies. There is no prohibition on such military activities in outer space generally.

The principle of peaceful uses of the moon and celestial bodies is further defined in Article 3 of the Moon Treaty. Paragraph 2 provides that the threat or use of force or any other hostile act or threat of hostile act on the moon is prohibited. This additional requirement adds little other than to make it clear that Article 2(4) of the UN Charter on the non-use of force applies to military activities on the moon and celestial bodies.

The legal situation with respect to military activities in outer space and use of outer space for peaceful purposes is analogous to how those terms have been interpreted with respect to the high seas. Article 88 of the 1982 UN Convention on the Law of the Sea (UNCLOS) states that the high seas are reserved for peaceful purposes. However, military powers such as the United States have interpreted this to clause to mean only that states are not to engage in threat or use of force or other acts of aggression from the high seas. In other words, their interpretation is that Article 88 simply means that Article 2(4) of the UN Charter applies to activities on the high seas. The

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military powers have not seen Article 88 as limiting their ability to use the high seas for military purposes such as conducting naval exercises or testing weapons. Nor have they seen it as limiting the right of their warships armed with nuclear weapons from exercising freedom of navigation on the high seas. The one limitation on military activities that was agreed upon in a 1971 Treaty is that states have agreed to prohibit the placement of WMD on the seabed and ocean floor.

The strict interpretation of the military powers with regard to the preservation of the high seas for "peaceful purposes" is consistent with Article 301 of UNCLOS on "peaceful uses of the seas". It provides that:

> In exercising their rights and performing their duties under this Convention, States Parties shall refrain from any threat or use of force against the territorial integrity or political independence of any State, or in any other manner inconsistent with the principles of international law embodied in the Charter of the United Nations.

In my opinion, the major powers, especially the United States, will continue to insist on a similar interpretation of the phrase use of outer space for peaceful purposes. It is highly unlikely that the international community will be able to achieve any consensus to further define or limit military activities in outer space.

Principle of Non-Appropriation

Dr Visoot has concluded that a steadfast adherence to the non-appropriation principle is not viable and will eventually need to be modified. His major reason for this conclusion is that he believes that outer space activities such as the mining of celestial resources will not be possible unless it is possible for states or private entities to appropriate some part of the celestial bodies. He argues that without appropriation the necessary investments will not be possible.

On this issue, I beg to differ from the author. I believe that mining activities can take place in outer space or on celestial bodies without modifying the principle of non-appropriation. Outer space, like the high seas and deep sea bed (or "the Area", as it is referred to in UNCLOS) is an area of the global commons that has always been subject to the principle that it is not subject to a national appropriation or a claim of sovereignty. Article 89 of UNCLOS provides that "no State may validly purport to subject any part of the high seas to its sovereignty." Article II of the Outer Space Treaty provides that:

> Outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means

The 1979 Moon Treaty has a similar provision in paragraph 2 of Article 11.

The controversial "Part XI" of 1982 UNCLOS on deep-sea mining in the Area provides that Area and its resources shall be governed by two fundamental principles -- the principle of common heritage of mankind and the principle on non-appropriation. Article 136 declares that the Area and its resources are the common heritage of mankind. Article 137 sets out the legal status of the Area and its resources, and provides that:

1. No State shall claim or exercise sovereignty or sovereign rights over any part of the Area or its resources, nor shall any State or natural or juridical person appropriate any part thereof. No such claim or exercise of sovereignty or sovereign rights nor such appropriation shall be recognized.
2. All rights in the resources of the Area are vested in mankind as a whole, on whose behalf the Authority shall act. These resources are not subject to alienation. The minerals recovered from the Area, however, may only be alienated in accordance with this Part and the rules, regulations and procedures of the Authority.
3. No State or natural or juridical person shall claim, acquire or exercise rights with respect to the minerals recovered from the Area except in accordance with this Part. Otherwise, no such claim, acquisition or exercise of such rights shall be recognized.

Part XI of 1982 UNCLOS was modified in 1994 by an Implementation Agreement. The 1994 Agreement did not change these basic principles. It did, however, radically change the deep sea mining regime governing exploitation of the resources of the deep sea-bed in order to meet the objections of the United States and other industrial states to the deep sea mining regime set out in Part XI. Among the most significant modifications made by the 1994 Agreement to the deep sea mining regime are the following:

(a) it modified the deep sea mining regime to embrace market-oriented policies
(b) it deleted provisions dealing with production limitations, mandatory transfer of technology and a review conference
(c) it increased the significance of the United States and other industrial states in structure and voting arrangements in the Sea-Bed Authority, thereby reflecting their long-standing interests in deep sea mining
(d) it streamlined the Sea-Bed Authority and curtailed its regulatory discretion
(e) it delayed and sharply confined the role of the Enterprise, the operating arm of the Sea-Bed Authority
(f) it made deep cuts to the financial obligations required of states and private companies who engaged in deep sea mining

The deep sea mining regime as modified by the 1994 Agreement was able to accommodate the objections of the United States and other industrial states and still maintain that the Area and its resources are governed by the principles of common heritage and non-appropriation. It accomplished this by establishing an international regime to regulate the exploitation of the resources of the Area, and by providing, as set in out paragraph 2 of Article 137, that the minerals recovered from the Area may only be alienated in accordance with Part XI on UNCLOS as modified by the 1994 Agreement. Critics from developing countries have argued that the result was the mutilation of the ideal of common heritage. However, it must also be conceded that the 1994 Agreement has resulted in the establishment of an international regime which will govern the exploitation of resources of the sea bed, including the preparation of regulations to protect the environment of the sea bed.

The common heritage provisions in Article 11 of the Moon Treaty envisage a similar legal arrangement over the natural resources of the Moon and other celestial bodies. Paragraph 2 provides that the Moon is not subject to national appropriation by any claim of sovereignty.

Paragraph 1 provides that the Moon and its natural resources are the common heritage of mankind, and that this principle finds expression in the provisions of the Moon Treaty, in particular paragraph 5 of this article. Paragraph 5 provides that:

> States Parties to this Agreement hereby undertake to establish *an international regime*, including appropriate procedures, to govern the exploitation of the natural resources of the Moon *as such exploitation is about to become feasible*. (emphasis added)

The main purposes of the international regime to be established are set out in paragraph 7. The one purpose which is likely to be the most controversial is the "equitable sharing" principle in (d). If the example of the deep sea mining regime is followed, this equitable sharing principle may have to interpreted so as to give due consideration to market principles and the investments and past activities of the industrialized countries which have engaged in exploratory activities for natural resources of the Moon.

Paragraph 3 of Article 11 is also consistent with the principle of non-appropriation as used in UNCLOS. It provides that:

> Neither the surface nor the subsurface of the Moon, or any part thereof or *natural resources in place, shall become property* of any State, international intergovernmental or non-governmental organization, national organization or non-governmental entity *or of any natural person*. . . . . The foregoing provisions are without prejudice to the international regime referred to in paragraph 5 of this article.

Paragraph 3 excludes property rights only of "natural resources in place". However, it allows for the existence of property rights over natural resources not in place and natural resources that have been removed from their original place. Further, it allows for property rights in natural resources to be recognized if they have been exploited in accordance with the international regime that is to be established.

Therefore, the Moon Treaty contains principles which will allow for the exploitation of natural resources of the moon and other celestial bodies, and for the recognition of property rights in natural resources that have been exploited in accordance with the international regime to be established to govern the exploitation of the resources.

The question that arises is whether the principles of common heritage and non-appropriation as outlined above are part of general international law notwithstanding the fact that the Moon Treaty is not in force and that many of the space powers have indicated that they do not intend to become parties to it. One method of advancing the development of general international law on this issue would be for the General Assembly to adopt a resolution declaring the general principles governing the moon and its natural resources. If the resolution were worded very generally, and if it were adopted when there is an administration in Washington which respects and supports the development of international law and international institutions, it is likely to be adopted without any negative votes.

Whether the international community will eventually be able to reach agreement on an international legal regime to govern the exploitation of the natural resources of the moon and

other celestial bodies remains to be seen. The international community was able to reach a consensus in 1994 on the international regime to govern the deep sea bed because of a unique number of factors. First, there was a sense of urgency to resolve the matter by mid 1994 because 1982 UNCLOS was about to enter into force without it having been accepted by major industrialized states. Second, there was a consensus that changes were required in order to ensure that UNCLOS was universally accepted. Third, significant political and economic changes had take place in the international community since Part XI of UNCLOS was drafted. Faith in state-sponsored socialism had been replaced by a market based economics and faith in private enterprise. In addition, technical studies indicating that deep sea mining would not be economically viable for many years. Therefore, the less developed countries and the industrialized countries were able to make the compromises necessary to establish an international regime to govern sea bed mining. Only time will tell whether a similar congruence of factors will enable to the international community to agree on a similar regime governing the mining of the resources of the Moon.

In conclusion, I agree with Dr Visoot on most points, but differ with him on two. First, I believe that it will not be possible for the international community to agree on an interpretation of peaceful purposes that will curtail military activities in outer space. Second, I believe that the principles of non-appropriation and common heritage can continue to govern the resources of the moon, and that they need not be modified. However, this assumes that notwithstanding the status of the Moon Treaty, the international community will be able to agree on the establishment of an international regime to govern the exploitation of the resources of the moon *as such exploitation is about to become feasible*. Only then will the various interests groups have the sense of urgency required to make the necessary compromises. The provisions governing the International Seabed Authority and the experience of that body should provide a useful starting point for the negotiations.

SESSION REPORTS

SESSION REPORTS

Based on the Reports submitted by the Rapporteurs: R. Nawinne, Debarupa Banerjee, Atsuyo Ito, Wongsuda Supaporn and Maria Buzdugan

Edited and compiled by **Tanja Masson-Zwaan**

SESSION 2 - National Space Legislation: Developments in Asia

Chairmen: Prof. Sang-Myon Rhee (College of Law Seoul National University, Korea) and Prof. Setsuko Aoki (Keio University, Tokyo, Japan)

Rapporteur: Mr. R. Nawinne (Sr. State Counsel, Sri Lanka)

The discussion paper was presented by *Dr. Zhao Yun* (City University, Hong Kong) and comments on the paper were made by *Prof. Paul Larsen* (Georgetown University, Washington DC, USA) and *Prof. V. S. Mani* (Director, Gujarat University, India). Comments were made and/or questions were raised by Prof. Joanne Irene Gabrynowicz (University of Mississippi, USA) Prof. Elisabeth Back Impallomeni (University of Padova, Italy), Prof. Sethaporn Cusripituk (National Telecommunication Commission, Thailand) Prof. Sergio Marchisio (University of Rome, Italy), Prof. Vladimir Kopal (Czech Republic), Prof. Sompong Sucharitkul (Golden Gate University, USA) and Prof. Robert C. Beckman (National University of Singapore).

Dr. Zhao's paper was entitled "National Space Legislation, with reference to China's practice." Mainland China was chosen as an example for his presentation, as the topic had been discussed at several forums. At the outset he mentioned that most member States to the *Corpus Juris Spatialis* agree that national space legislation is necessary.

He submitted that new activities have arisen with commercialization, privatization and globalization, and in such an environment there had not been a single treaty drafted during the last thirty five years. Since UNCOPUOS has not formulated new rules and in the absence of an express need, national space legislation has to provide a framework to regulate space activities in the present context.

Dr. Zhao raised four main points relating to aims and objectives of national space legislation:

- Providing a supervisory framework for space activities;
- Legal obligation to abide by International Treaties;

- Promotion of commercialization and involvement of private entities, and
- Optimization of the utilization of the outer space.

National space legislation can provide a framework to supervise national space activities and to carry out international obligations provided in the treaties, such as, authorization, continuous supervision, international responsibility and liability. National space legislation is also a means for states to abide by and implement their international commitments, to promote commercialization and to find new entities. Referring to the opening address of Ms. Tanja Masson-Zwaan, where she mentioned that new issues have arisen in this field, such as in relation to intellectual property, property rights, space tourism etc., he said that the vacuum that has been created in space legislation in view of such developments should be filled promptly. Further, in view of the fact that international space legislation is in a stagnant stage, national space legislation should be the only way to formulate new rules to regulate such national activities, although the five space treaties should serve as the starting point.

Nevertheless he recognized that national space legislation, whilst being guided by the uniform international space treaties, should differ considering the national interest, such as, social and economic development, national legal traditions and the nature of the space activities carried out by the state. Accordingly, national space legislation should be adapted to the national needs without defeating the main aims and objectives and the need for international cooperation.

Dr. Zhao then summarized China's space legislation, with particular reference to the White paper on China's space activities. He discussed the history of China's space activities, which accelerated China's pace in legislation, commencing with its first launch of a satellite in 1970 (DHF-1), its becoming a member of the UNCOPUOS, the ratification of the space treaties, reforming the administrative system and the creation of the CNSA. China has adopted two main regulations so far (the Provisions and procedures for the Registration of Space Objects, 08.02.2001 and the Interim measures on the administration of permits for civil space launch projects, 21.11.2002). The regulation relating to registration was the first domestic administrative regulation and it was intended to fulfill China's commitment under the Registration Convention and the practical situation in China. Measures have been made for a register in relation to Hong Kong SAR and Macao SAR. The Space Licensing regulation applies for launches from the territory of China, but excluding launches for military use. China has also adopted a few other regulations with regard to space activities. Space legislation is among the highest priorities on the CNSA's agenda. China has initiated a special platform to study the issue of national space legislation, which includes a project to study and compare existing space legislation. New draft legislation has been put forward to deal with liability.

In conclusion, Dr. Zhao said that national space legislation has never been as important as at the present stage in view of space commercialization and privatization. The international society has acknowledged the need and the urgency of national space legislation and that a pragmatic attitude has to be adapted to national space legislation.

Professor Paul B. Larsen's commentary paper dealt with 'Commercial Space Launches'**.** He made particular reference to large operators like Boeing, Lockheed and Otrom, and small operators like Falcom, Mr. Bhutan and Bigelow Aerospace, which has a variety of commercial operation. The Australian Space Launch Act provides a definition of outer space at 100 km. He

analyzed the provisions of Article 1 and 6 of the Outer Space Treaty and the *lacuna* of the definition of the appropriate State in Article 6. Analyzing the provisions of Article 7 and 8 of the said treaty he said that it intended the launching State to be the appropriate State. He examined the provisions of the Liability Convention as to the appropriate state and discussed the problems that may arise when a transfer of a space object take place. He explained that the operators would find out the rules in outer space and then would decide how they should behave, but the real issue for commercial operators is liability. He stated that although there is no cap on liability under the Liability Convention, the United States has made provisions for liability limits for commercial operators and the alternative limit, i.e. maximum insurability. He also elaborated on the requirement of cross waivers.

Issues such as public safety, national security (Wassenaar Agreement), financing and their implication on the commercial operators were also addressed. Prof. Larsen explained that under US legislation, the Government shall promote commercial operators.

Prof. Larsen also discussed the proposal of Mr. Bigelow's hotels in outer space in view of the requirement of continuing supervision in respect of space activities. Lastly, in view of the fact that Thailand has launched several satellites, he noted that Thailand should look at drafting national space legislation, as well as India.

Prof. V. S. Mani in his commentary paper referred to the Statement of the Board of Directors of the International Institute of Space Law (IISL) on the non-appropriation issue by private parties and said that it has clearly underscored the need for national space legislation. The issue of national space legislation should not only be addressed at seminars, but the IISL should take the initiative to get an appeal from the UNGA and indicate the areas that would require national space legislation. He stressed that legislators should try and implement national policy through national space legislation, and that national policy and national legislation should go hand in hand.

He divided his presentation to three parts, i.e.

- Why domestic space policy and space legislation;
- Models for space legislation, and
- A framework for national space legislation mainly in relation to picking points.

On the first point, a space policy is important for many reasons, including that it ensures government commitment and support to the national space programme on a continuous and stable basis and that it facilitates better coordination among various government departments in promoting better utilization of the benefit of space science and technology. Also, a formally proclaimed space policy is likely to contribute to dispelling the suspicion and the danger in some countries of the diversion of the full used technology for military purposes of India and to reaffirm in India's commitment to the principles of peaceful uses of the outer space. Space legislation is needed in India, among others because there is no guarantee that the present situation that did not require special law would continue to exist in future. Also, in view of the expansion and diversification of space activities and increasing involvement of private industry with the onset of commercialization and liberalization, there is an urgent need to clarify applicable legal norms and rules of both public and private law. Moreover, Article 51 of the Indian Constitution mandates States to respect international law including treaty obligations

undertaken by them and many of the treaty obligations require implementation through domestic law.

On the second point, discussing probable models for Indian Space Legislation, Prof. Mani said that there is a wide variety of models available at present and categorized them into two groups. The US model has many elaborately drafted space law legislations, and on the other hand the Swedish model has not more than one line stating that the government is authorized to issue licenses. It is good to learn from these models, but not to follow them blindly. He agreed with Dr. Zhao that each country has its own peculiarities and India should develop a model of its own, just like other country.

Regarding the last point, Prof. Mani suggested some picking points for India:

- The law should reflect the policy
- Institution mechanism as it stands can be translated into law
- It should ensure that international obligations are implemented nationally
- It should be a kind of umbrella legislation, not too elaborate
- It should empower private industry and provide scope for subordinate legislation for each activity
- It should enable regional and international cooperation.

In the discussion that followed the presentation of the three papers, *Prof. Elisabeth Back Impallomeni* (Italy) asked about the comments by Dr. Zhao that national space legislation could promote commercialization, privatization of space activities and that international legislation could hamper and discourage private enterprises to start space activities. *Dr. Zhao* clarified that national space legislators should be mindful of several factors and will have to conduct an assessment to find the kind of legislation that would be beneficial and would not hamper space activities.

Prof. Sethaporn Cusripituk (Thailand) wondered about the situation where the national space legislations of two states involved in a dispute would have different definitions as to the limits of outer space.

Professor Sergio Marchisio (Italy) stressed that the implementation of the five treaties is the main objective of national space legislation. He cited the Registration Convention as an example, as well as the Liability Convention and Article 6 of the Outer Space Treaty, where some of the provisions that cannot be implemented without national legislation. He also said one can have several legislations approving, repealing or integrating the international treaties.

Professor Vladimir Kopal (Czech Rep.) characterized international space law as a developing system and not a completed system. He stressed that international space law has established a basis for all space laws and there should not be a contradiction of national space law with international space laws. He expressed the view that national space law should honor the basic principles of international space law, and if there is a difference between these two systems, international space law principles should prevail. Some of the principles of international law have already gained an imperative character and they have been recognized by practice and also by legal documents as legally binding and having the character of *jus cogens* in the sense of Article 53 of the Convention on the Law of Treaties of 1969. Prof. Kopal said that he believed that this

imperative character should be attached to Article 2 of the Outer Space Treaty on non-appropriation of outer space, the moon and other celestial bodies, as well as to the principles embedded in Article 3 of the Outer Space Treaty, in that the activities on the exploration and use of outer space should be developed in accordance with international law including the Charter, in the interest of maintaining international peace and security and promoting international cooperation and understanding. He also referred to the principle in Article 6 of the Outer Space Treaty.

Regarding the issue of limitation of liability, *Prof. Marchisio* said that in recent practice this concerns launches; in fact states involved in launches are requested by the launching state to apportion or share the responsibility and liability for the launch through agreements. He said that a law is necessary to regulate such issues and that they should be dealt with by national legislation.

Prof. Robert C. Beckman commented that some of the issues that arise in space law also exist in other areas such as ocean law where commercial operators would look for minimum regulation of their activity and minimum liability (flags of convenience). A state not party to the Outer Space Treaty could enact legislation and encourage commercial operators to register there to avoid liability and it could thus collect fees for such registration.

In conclusion, the presenter of the discussion paper, the commentators and the participants were in agreement that there is a need for national space legislation in view of the commercialization and privatization of space activities and to give effect to the *Corpus Juris Spatialis*. The majority expressed the view that each state should have its own model of legislation. However, they agreed that they could take into consideration the national laws of other States and the principles embedded in the five treaties. Concerns were expressed as to the contradictory situations that may arise between international space law and national space law. In such situations, international space law should prevail over national space law.

SESSION 3 - Asia's Role in Remote Sensing and Legal Aspects of Access to High-Resolution Satellite Imagery

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Chairmen: Dr. Suvit Vibulsresth (Geo-Informatics and Space Technology Development Agency, GISTDA, Thailand), and Prof. VS Mani (Director, Gujarat National Law University, India)

Rapporteur: Ms. Debarupa Banerjee (NALSAR University of Law, Hyderabad, India)

This session focused on the remote sensing capabilities of the Asian region with special emphasis on the legal aspects of access to high resolution satellite images. The discussion paper author was Mr. K. R. Sridhara Murthi while the two commentary papers were presented by Prof. Sergio Marchisio and Prof. Ram Jakhu respectively.

Discussion paper author *Mr. Sridhara Murthi* (Antrix Corp., India) divided his paper into two parts, the first dealing with Asia's role in remote sensing and the second with the legal aspects of access to high resolution data. He noted that the Asian region is very active in remote

sensing, launch activities, maintenance and development of applications. He cited developments in China, Japan, India, Korea, Thailand, Singapore, Indonesia and Malaysia. Next, he explained that government policies in this region largely treat such data as public goods and therefore the derived applications mostly concern day-to-day problems relating to weather, water, agriculture, etc. Mr. Murthi also stressed the need to tap the so far untapped potential of the region relating to high resolution imagery and maintained that there should be international norms to combat different state practices which lead to confusion. On the issue of the 1986 UN Principles on Remote Sensing, Mr. Murthi stated that these Principles do not seem adequate and he stressed the need for good law. Next, regarding the issue of rights of the sensed state, Mr. Murthi observed that to a certain extent, safeguards are given in the Principles but they are not comprehensive. He concluded his presentation with the statement that the world is currently facing many new challenges which were not anticipated at the time of drafting the UN Principles and therefore issues need to be debated in a harmonized international framework of legal norms, under an appropriate multilateral forum.

The first commentator, *Prof. Sergio Marchisio* (University of Rome, Italy) stated that no law is perfect and that the same applies to the 1986 Principles. He highlighted the distinction made in the Resolution between remote sensing and remote sensing activities, by saying that remote sensing involves space activities while remote sensing activities are based on ground-related operations such as data processing and dissemination. He emphasized that the Principles are confusing but not contradictory and that they apply to high resolution imagery as well. According to him, state practices should try and harmonize security concerns with data availability. At the same time, restrictions relating to security concerns should not be seen as contrary to the Principles. He concluded on the note that reopening the discussion on the UN Principles could be dangerous.

Prof. Ram Jakhu (McGill Institute of Air and Space Law, Montreal, Canada) delivered the second commentary. He agreed with Prof. Marchisio in principle but differed on technicalities. He emphasized the fact that the UN Principles were negotiated in good faith and over a period of time. He mentioned that it took 8 to 9 years to negotiate the Principles, which take into account the positions of many different countries. To now say that they are not adequate would be undermining the very international law-making process. He also argued that restrictions on high resolution imagery imposed unilaterally by countries are contrary to the Principles. These restrictions are not provided for under the Principles and undermine the international law-making process.

Mr. Murthi was then given the opportunity to react to the points raised by the commentators. He defended his paper by saying that the Principles, being only a framework and not binding law, do need a rehaul. He also observed that self-regulation adopted by the industry is dangerous and we have to keep this point in mind.

The discussion that followed mainly centered on the question raised by the rapporteur, *Ms. Debarupa Banerjee*, in response to Prof. Jakhu's statement that there was a problem with unilateral imposition of restrictions on high resolution imagery by countries. The question was whether it did not override the established norm of national sovereignty. *Prof. Jakhu* replied that the answer was both yes and no. If there is a unilateral restriction against the essence of the Principles, then national sovereignty becomes secondary. In such cases, in effect, the Principles override national sovereignty. In all other cases, the answer would be no.
With this, the session was successfully concluded.

SESSION 4 - Legal Aspects of Disaster Management: Initial Results and Suggestions for Improvement of the International Charter on Space and Major Disasters

Chairmen: Prof. Sergio Marchisio (Director, Institute for International Legal Studies, National Research Council, Italy) and Mr. K. Sridhara Murthi (Antrix Corp. India)

Rapporteur: Ms. Atsuyo Ito (University of Paris XI, France)

The discussion paper was presented by *Dr. IBR Supancana* (Centre for Regulatory Research, Jakarta, Indonesia) and was entitled 'Space Contribution for Disaster Management: Legal Framework'. He expressed the view that developing a better response and disaster management at the domestic, regional and global level is necessary. He stated that the lesson learned from the Tsunami experience is the coordination issue, as affected countries were not prepared to handle such a large scale disaster, when quick response was needed.

He contended that disaster management should cover activities including prevention, preparedness, early warning, emergency response, relief, evacuation, mitigation, recovery, rehabilitation, and reconstruction, together with the contribution of space technology in the disaster management in each phase. Then, he discussed the legal framework of disaster management. He gave an overview of past and current initiatives, including the Yokohama strategy, of existing international institutions dealing with disaster management, such as the UN OOSA, ITU, and ESCAP. Then, he discussed two legal instruments, namely the International Charter on Space and Major Disasters, which provides for extensive international cooperation to provide satellite images free of charge to countries affected by disasters, and the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations, which contributes to greater availability of telecommunication equipment for disaster mitigation and relief.

Lastly, Dr. Supancana discussed the possibility of establishing a Coordinating Body on International Space Cooperation and disaster management, by means of the Disaster Management International Space Coordination Organization (DMISCO). He concluded by giving the following remarks:

- There is a need for better management in dealing with future disasters;
- Past experiences demonstrated that application of space technology contributes highly to disaster management and disaster mitigation;
- We need a better coordination mechanism to deal with disasters, accommodated by a proper legal framework through binding legal instruments and the existence of effective international organizations.

Prof. Vladimir Kopal (Czech Republic) shared the latest information on the DMISCO from the Committee on Peaceful Use of Outer Space (COPUOS) this year. It was decided that DMISCO is going to be established in Beijing, China and Bonn, Germany. They competed successfully among several States including Switzerland that will remain a sponsoring State.

In her commentary paper, *Prof. Joanne Gabrynowicz* (National Remote Sensing and Space Law Centre, University of Mississippi, USA) gave a comprehensive overview covering both operational and legal aspects together with an interesting analysis of the legal status of the Disasters Charter. She reviewed definitions of some of the key terms and gave definitions of four categories of participants, covered disasters, available resources, and basis of participation. She stressed that the Disasters Charter is in force for five-year periods to be automatically extended for subsequent periods of five years.

She then explained the nature of Disasters Charter as an instrument to facilitate a growing number of activities and objectives less suited to the formal treaty-making process. She noted that participation to the Charter is on a voluntary basis and provisions are non-binding principles and based on good faith. She pointed out that successful Charter operations have catalysed a number of results and emerging practices that may be relevant to its status over time. Then she stated that as regards the scientific and space community, the more effective the informal character and behaviour agreed by the parties proves to be, the more this practice becomes recognized as perfectly and politically authoritative. She noted that the non-binding status of the Charter might change over time to have customary value based on *opinio juris* and state practice. She expressed her view that it will be important to assess the quantity and quality of a wide variety of variables to assess the Charter's potentially evolving status, particularly, the number of automatic renewals. Frequent renewals of the Charter could imply that it gets closer a legally binding agreement.

In conclusion, Prof. Gabrynowicz observed the following:

- It will be necessary to identify differences and commonalities in various instruments, e.g. the UN Remote Sensing Principles that govern and guide Disasters Charter activations;
- An important feature of disaster management is that it is carried out by individuals at the lower level of government;
- This has an impact on agency resources.

Next, *Prof. Peter Malanczuk* (City University, Hong Kong) gave a thorough analysis of disaster management from the standpoint of a general legal framework. First, he distinguished between natural and man-made disasters, explaining that natural disasters are not preventable whereas man-made disasters are preventable and are of different types including armed conflicts. He stated that the distinction between the law of war and peace is significant.

He contended that the historical development of disaster relief has not been very successful both operationally and legally. As to relief operations, the original attempt to establish an international relief agency under the League of Nations was not very successful and was abandoned in 1967. He noted that the development of rules at the international level has not produced any comprehensive Treaty. Some attempts have been made at a regional level, but did not gain sufficient support. A number of bilateral agreements exist but they are mainly concentrated in Europe and not in Africa and Asia. He also mentioned some instruments at the multilateral level, such as the Millennium Declaration, which states that the impact on victims of disasters is relatively minor compared with that of armed conflict.

There is a gap in international law in disaster relief, as became clear during the 2004 Tsunami. It was difficult to coordinate actions among the 12 governments. The International Federation of Disaster response law Programme, an international framework to deal with disaster relief operations, made a study of multilateral and bilateral treaties which shows that there is a lack of general principles, and they are disparate and inconclusive. Prof. Malanczuk expressed the view that it is more likely that rules regarding disaster relief would remain on a soft law basis and that this is not necessarily ineffective. He concluded that the Disasters Charter is an important development but has to be seen in the general framework of international law, which is inadequate.

After the presentations, a very active and fruitful *discussion* took place. Participants made a number of thought-provoking comments and remarks, and raised interesting questions.

Prof. VS. Mani (India) noted that it is more efficient to examine the guidelines rather than waiting for binding treaties. He mentioned the contributions of the ICRC in regard to relief and rehabilitation and that the American Red Cross updated some general principles in 2000, which are specifically applicable to man-made disasters. He expressed the view that disaster management law is needed, particularly with respect to disaster prevention – a duty to notify and to assist in relief and rehabilitation. In this respect, remote sensing is extremely useful.

Ms. Tanja Masson-Zwaan (The Netherlands) asked whether a duty to warn exists, and whether such a duty is accompanied by sanctions and whether non-compliance would entail liability. After the 2004 Tsunami, there was a lawsuit by families of victims suing one of the centres because they failed to issue an adequate warning. This shows that similar cases may arise in the future and she asked whether such liability could be construed under the Charter or Liability Convention. She also raised the question about the relationship between DMISCO and the Charter, and wondered whether the Charter, which is at Agency level, would be incorporated under DMISCO, which is at governmental level.

Prof. Peter Malanczuk replied that he doubts whether there is customary law with respect to a duty to warn. He noted that such a duty would be attached to international responsibility. The issue would come up as to how to deal with a violation of this duty - this would imply state responsibility for an internationally wrongful act on the basis of the ILC articles on state responsibility adopted in 2001. Concerning the Disasters Charter, he noted that it is not an international treaty instrument and falls below a hard law instrument. If the DMISCO is set up, it would have legal personality on treaty basis.

Prof. Sompong Sucharitkul (Thailand) made some remarks about the duty to warn, mentioning the Corfu Channel Case which provided that failure to notify under no actual proof of awareness on government could result in liability. He then brought to the attention of the panel the question of the obligation to accept humanitarian assistance, as host governments sometimes have second thoughts about receiving or accepting humanitarian assistance.

Prof. Vladimir Kopal (Czech Republic) mentioned the reluctance of governments to accept binding obligations, often preferring to cooperate only if it is appropriate for them. The Disasters Charter was developed from a scientific approach and thus it is important to think about the future development of international law in this field.

Regarding an obligation to accept offers for assistance, *Prof. Malanczuk* doubted that there a treaty-based obligation exists. There may always be political obstacles preventing disaster relief operations. He saw three levels where progress can be made:

- The Millennium Report, the 2005 Disaster Preparedness Mitigation initiative, and the establishment of a world-wide early warning system for all natural disasters building on existing regional and national capabilities;
- ASEAN, which is a good forum for cooperation; and
- The International Red Cross, which has proposed guiding principles.

Mr. Sridhara Murthi wondered whether liability would inhibit agencies to cooperate more. If it is the case, why not reverse the process and make it a liability-free operation so as to create incentives for greater cooperation. He noted that most of the space agencies are commercial and willing to spare some part of their resources in response to disasters. He also stressed the importance of efficient response time; a lot of work and research are needed to be able to respond in time even without getting into the question of liability.

In closing the session, *Prof. Sergio Marchisio* recalled the UN Remote Sensing Principles and stated that the Disasters Charter is in fact an implementation of Principle XII. He stressed also that the Remote Sensing Data Policy under the Disaster Charter is that data are given free of charge. Prof. Marchisio then thanked the speakers and audience, and concluded the session.

SESSION 5 - Regional Cooperation in Asia relating to Space Activities

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Chairmen: Prof. Paul Larsen (Georgetown University, Washington DC, USA) and Prof. Chia-jui Cheng (Chairman, Asian Institute of International Air and Space Law, Taipei; Secretary-General of the Curatorium and President of Xiamen Academy of International Law, Xiamen)

Rapporteur: Ms Wongsuda Supaporn (Chulalongkorn University, Thailand)

The author of the Discussion Paper was *Professor Sang-Myon Rhee* (Seoul National University, Korea). He analyzed the various problems amongst Asian countries, using Northeast Asia as a model. There are three main problems in Asia, including the lack of cooperation in space activities, the lack of a common arena and fora and a lack of dispute settlement mechanisms. He described the lack of cooperation in the areas of launching, monitoring, maintenance and rescue of space activities. He further stated that the second problem, the lack of common arena and fora, is caused by the lack of a multilateral body such as an East Asian space authority, a Satellite Telecommunication authority, or central authorities dealing with direct broadcasting and remote sensing. The third problem was the lack of dispute settlement mechanism.

Prof. Rhee claimed that the symptoms can be divided into four groups, including territorial sovereignty hindering free flow of information, high competition amongst Asian countries as opposed to having a fair distribution, a sense of unilateralism amongst Asian nations instead of multilateralism, and the sense of security which has always been disregarded and violated instead of respecting human rights.

He mentioned the current state of space cooperation activities amongst Asian countries which is insufficient. The proposed solution to the problems was to find a short and long term cooperative mechanism. The proposed method was finding mutual interest among these Asian countries and build on it. Prof. Rhee insisted that standards must be built through using both general and international law as a dispute mechanism tool. He also suggested that the sense of multilateralism among these nations by being open, respectful, trustworthy and fair must be promoted. One method to develop Asian regional space activities cooperation is to have the powerful nation initiate and demonstrate such activity. China and Korea or China and Japan or Korea and Japan should demonstrate fair space activities cooperation. This will set the trend and create a norm causing a ripple effect where other Asian countries will follow to cooperate with other Asian countries in the field of space activities.

The first commentator for this session was *Professor Setsuko Aoki* (Keio University, Japan), who concurred with the idea proposed by Prof. Rhee. She believed that the concept of Space Activities Cooperation should be divided into three categories. Her theory was to find a common ground for cooperation in space activities among Asian countries in the region and focus on it. The first category was independent space capability, the second category was national remote sensing satellites, telecommunication capability on various space applications and the third category was space applications. After thoroughly analyzing the current and historical background of three Asian countries (Thailand, Malaysia and Indonesia), she concluded that these countries were highly interested in focusing on the second category, remote sensing for disaster monitoring and environmental observation. She suggested that theses countries should focus on space utilization through setting up a regional agenda where space applications will be shared and data dissemination criteria will be clearly defined. Along with that, a better observed international standard has to be implemented and agreements must be truly safeguarded. Regional cooperation means that a balance between space benefits and national security must be found. Lastly, Prof. Aoki suggested that regional cooperation should use European-type cooperation as a model.

Mr. Masahiko Sato (JAXA, Japan) started his comments by introducing an overview of Japanese space activities and JAXA. Building on Prof. Aoki's proposal, Mr. Sato explained that one of the goals of JAXA is to provide a disaster risk management system in the Asia-Pacific region. He further explained that the Asia Pacific Region Space Agency Forum (APRSAF) was establishing a project called Sentinel Asia. The Sentinel Asia project focused on remote sensing for disaster monitoring and environmental observation, where JAXA will serve and provide telecommunication capability tools on various space applications for the project.

Professor Elisabeth Back Impallomeni (University of Padua, Italy) was the last commentator. She suggested that the method in obtaining Asian Space Activities Cooperation should be derived from understanding both the historical and current factors should look at other successful international Space Activities Cooperation such as within the European Space Agency (ESA). She gave a historical review about the creation of two intergovernmental organizations, the European Launching Development Organization (ELDO) and the European Space Research Organization (ESRO), which in 1975 were replaced by the European Space Agency (ESA), and the difficulty they confronted during the creation. She further explained that ESA was launched only after political division in Europe had subsided and how regional space cooperation yielded influences on the international scene resulting in European Community (EC) and European Union (EU) interest in cooperating. Eventually, a European Constitutional

Treaty was drawn up and by 2003 a European Framework Agreement was developed. The framework of two intergovernmental organizations included numerous models for projects. Her suggestion was for the Asian countries to reference these European Framework Agreement models for future Asian Space Activities cooperation.

At the end of the session, some of the participants found that the theories were credible and very well thought through, but at the same time many remained skeptic. They felt that Asian historical, economical, social and political norms would persist and could be hard to overcome.

SESSION 6 - Legal issues arising from space exploration & exploitation

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Chairmen: Prof. V. Kopal (Charles University, Czech Republic) and Prof. Elisabeth Back Impallomeni (University of Padua, Italy)

Rapporteur: Dr. Maria Buzdugan (McGill Institute of Air and Space Law, Montreal, Canada)

The author of the discussion paper was *Dr. Visoot Tuvayanond* (University of the Thai Chamber of Commerce). Dr. Tuvayanond commenced his presentation by pointing out that his paper raises issues that were purposefully aimed to provoke debate among participants. Noting that new discoveries in outer space and the development of new space applications have outpaced the adoption of legal provisions regulating these new realities, Dr. Tuvayanond made the argument that the current legal regime, adopted decades ago, appears to be incomplete and, thus, partially inadequate in providing legal answers to emerging issues in the field of space activities. He then proceeded to point out several aspects that are, in his opinion, in need of legal answers.

First, he mentioned the issue of the boundary between airspace and outer space, which seems to become more and more relevant in the context of the advent of hybrid craft capable of suborbital flights. The traditional or conventional view according to which the upper limit of air space was determined by the outer limit of effective aerodynamic lift is currently obsolete given the new technology that allows aircraft with space faring capabilities to fly to a much higher altitude. A criterion that appeared to come closer to general acceptance is that the upper limit of territorial airspace is situated at the lowest perigee of an orbiting satellite. However, the invention of the hybrid crafts such as X-15 and Space-Ship-One which can fly as spacecraft with the ceiling of their flight being qualified as "sub-orbital", would lead one to infer that the outer space boundary is "below the orbit". The issue of the boundary between outer space and air space has significant consequences given the different legal regimes applicable to air space and outer space.

Another aspect that requires legal clarification is the distinction between aircraft and spacecraft. Dr. Tuvayanond mentioned that COPUOS sent out to its member States a questionnaire concerning the definition of an aerospace object or spacecraft; to date only few States have replied to this questionnaire; Thailand is among the countries that appear reluctant to give a definition of spacecraft *versus* aircraft. Dr. Tuvayanond urged Thai authorities to provide an answer since the issue of distinguishing between an aircraft and a spacecraft is a very important one. In this speaker's opinion, an aircraft that has spacecraft carrying capability – a hybrid craft – should be classified as a spacecraft or as an aircraft depending on its mission, i.e.,

if its purpose is to transport people and cargo from one place to another on Earth, it is to be considered an aircraft, even if it travels through outer space; while if its purpose is to transport people and cargo to outer space, it is to be considered a spacecraft that is only in mere transit through the airspace of the subjacent State. The distinction has an impact on whether such hybrid craft requires the prior consent of the subjacent State for transiting that State's airspace, i.e., if classified as spacecraft, no prior consent for transit through airspace is needed, while an aircraft would require such consent. Specific reference was made to the case of SpaceShip One, that has to transit through airspace but its mission is in outer space. According to Dr. Tuvayanond, SpaceShip One should be considered a spacecraft in transit through the air space of the subjacent State *en route* to and from the outer space and thus not requiring prior consent for transit. The speaker anticipated that this view may be controversial.

Another issue addressed by the speaker was the liability of the launching State, especially in situations where the launch of a space object is from a "mother-craft" in airspace. The question is whether the States that would give permission of passage over their territory and from whose airspace the launch of Space-Ship-One is made should be considered "launching States" and consequently held liable under the Liability Convention. A related issue may appear if States through whose airspace the hybrid craft would transit refused to grant the right of passage, thus potentially impeding the launch of Space-Ship-One. The solution, in Dr. Tuvayanond's opinion, is to consider that the combined vehicle is subject to the space law regime, both in regard to the liability and the right of transit, but the mothercraft, White Knight, should be subject only to the air law regime after the launch of Space-Ship-One.

The next issue addressed by the speaker was that of military uses of outer space. According to customary law, military uses of outer space come under "peaceful uses" of outer space and are not prohibited as long as such military uses are not for aggressive purposes. The speaker noted that, in many instances, there is a fine line between peaceful and aggressive uses. Such example is the use of reconnaissance satellites given that remote sensing could and is used in military activities (e.g., the use of GPS in guiding missiles in the "Shock and Awe" US military intervention in Iraq). The withdrawal of the United States from the Antiballistic Missile Treaty that banned space-based weapons is considered by the speaker as a worrisome precedent. Moreover, a doctrine recently set forth by the US Air Force makes reference to the "right to attack" not only enemy satellites or ground stations, but also the satellites and ground stations of neutral third countries that are being used by the enemy nations. In addition, according to a Pentagon document, there are plans to develop a weapon called the Common Aero Vehicle which can strike anywhere from half-way around the world in 45 minutes. Dr. Tuvayanond admits that the US position is understandable given the threat posed by the long range missiles.

The speaker also mentioned the need for regulating aspects streaming from the advent of space tourism, the development of which will be influenced significantly by lower transportation costs. Ending on an optimistic note, Dr. Tuvayanond expressed his view that the use of carbo nanotubes in building space elevators is likely to reduce the cost of travel even more, thus gradually transforming what was the fantasy of space travel into a reality available to more and more people.

Prof. Kopal thanked the author of the discussion paper for his presentation and commented that some of the issues addressed, although very interesting, are not of immediate application (such as the space elevator).

Prof. Robert Beckman from the Faculty of Law, National University of Singapore, provided his comments on the discussion paper. Prof. Beckman stated that, although he agreed on most issues with Dr. Tuvayanond, their opinions differ on two topics: military uses of outer space and the principle of non-appropriation in outer space (the latter was analyzed in the discussion paper, although Dr. Tuvayanond did not get to it in his oral presentation). Regarding military activities in outer space, Prof. Beckman cautioned against the risks of reopening issues that were settled in the Outer Space Treaty (OST). Article IV of the OST imposes two limitations on military activities. First, there is a prohibition of stationing in the orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction (WMD). Second, the Moon and other celestial bodies are to be used exclusively for peaceful purposes and the following military activities are prohibited: the establishment of military bases; the testing of any types of weapons; and the conduct of military maneuvers on celestial bodies. The Moon Agreement elaborated the principle of peaceful uses of the Moon and other celestial bodies and made Article 2(4) of the UN Charter on the non-use of force applicable to military activities on the Moon and celestial bodies.

Prof. Beckman made an analogy with the provisions of the UN Convention on the Law of the Sea, which in Article 301 defined the "peaceful uses of the seas" as meaning "non-aggressive" purposes. This is the view adopted by the United States and, in Prof. Beckman's opinion, there should be no challenge to this interpretation since revisiting the definition of "peaceful uses" is not likely to lead to a consensus in limiting further military activities in outer space in today's international context.

Regarding the second issue on which Prof. Beckman disagreed with Dr. Tuvayanond, i.e., the non-appropriation principle, the speaker pointed out that this concept is viewed as one of the fundamental principles of space law and is enshrined in the Outer Space Treaty, together with the principle of common heritage of human kind, reflected in the Moon Treaty. These two principles are also crystallized in the UN Convention on Law of the Sea (UNCLOS). Despite the subsequent modification of this Convention (by the 1994 Implementation Agreement), the principles of common heritage of mankind and the principle of non-appropriation remained unaltered in the text of UNCLOS (Articles 136 and 137). What was revised in 1994 was the deep sea mining regime, which initially reflected the idea of equitable sharing of benefits and redistribution of world wealth, principle advocated by the developing countries. In 1994, this regime was modified to embrace market-oriented policies advanced by the United States and other industrial States, while still maintaining that the deep sea bed and its resources are governed by the principles of common heritage and non-appropriation. This was accomplished by creating an international regime to regulate the exploitation of the resources of the deep seabed. According to this regime, an international body, i.e., the International Seabed Authority, was established with the purpose of defining the conditions under which the sea resources can be removed and used. The speaker urged the participants to check the International Seabed Authority's website for more information about its mandate and activities. In Prof. Beckman's opinion, this regime serves as an example of how such an international organization under an international regime could replace the need to rely on national laws for recognition and enforcement of property rights with regard to resources. The question is whether countries are now ready to adopt such a regime to govern the mining of Moon resources under the provisions of the Moon Treaty. In 1994, reaching a consensus on the regime applicable to the seabed was explained by several factors. First, most countries perceived a sense of urgency to clarify this matter since the 1982 UNCLOS was about to enter into force without having among its parties

the major industrialized states. Another factor was that significant economic and political changes were taking place in the world and even developing countries were starting to pay attention to market-based economy. In addition, by 1994, the Soviet Union lost much of its status as a super-power. At the same time, technical studies were indicating that deep sea mining would not be economically viable for the next 40 years. Due to these particular circumstances, both the developing countries and the industrialized countries were prone to make the compromises necessary to create an international regime applicable to seabed mining. Prof. Beckman concluded his presentation by advocating the need to interpret the concept of "equitable sharing" of outer space resources under the Moon Treaty provisions in light of the UN Space Benefits Declaration and the UNCLOS.

Prof. Kopal thanked Prof. Beckman for his comments, but disagreed with the speaker regarding the transferability of the regime applicable to the international seas to the case of outer space resources. He pointed out that the Outer Space Treaty was adopted on 1967, while the UNCLOS in 1982 (amended in 1994).

He then opened the floor for questions and comments.

Ms. Tanja Masson-Zwaan asked whether in Prof. Beckman's opinion there is a difference between the concept of "common heritage of mankind" reflected in the Moon Agreement and the notion of "province of mankind" adopted by the Outer Space Treaty. Prof. Beckman stated that the two concepts are different, with the "province of mankind" term including the idea of *res communis*. *Prof. Kopal* stressed that the Outer Space Treaty does not refer at all to the concept of "common heritage of mankind". OST says that the *exploration and use* of the outer space shall be the province of all mankind, not the resources.

Prof. Ram Jakhu expressed his agreement with Prof. Beckman's view that the Moon Agreement should be interpreted in the context of international law. Second, he pointed out that, although it is true that Art. IV of the OST prohibits only the placing in orbit of nuclear weapons and any other kinds of weapons of mass destruction, the question for Prof. Beckman is whether in his opinion the provisions of Art. III of the OST could be considered in order to enhance the international cooperation, in the interest of promoting international peace and security. *Prof. Beckman* answered by remarking that the provisions of Art. III of the OST are fairly vague and may be interpreted to mean that a heavy militarization would be in violation of its provisions, but he still thinks that States have agreed to interpret "peaceful uses" as including "defensive purposes". *Prof. Kopal* referred to the various interpretations given to the "peaceful purposes" and the controversy on whether the concept meant "non-military" activities or just "non-aggressive" purposes.

Dr. Supancana referred to Prof. Beckman's reference to the 1994 compromise between developing and developed countries reflecting trends in the market economy and crystallized in amendments to the Law of the Sea and asked whether a similar approach would be applicable nowadays in interpreting the CHM concept. *Prof. Beckman* argued that the interpretation of the CHM concept could be reconsidered when defining the international regime envisioned by the Moon Agreement. The economic views at that time could be completely different than the ones at the present time.

Prof. Paul Larsen pointed out that, in light of recently-published NASA policy statements, the question of the legal framework for economic exploitation of outer space resources transcends all academic discussions and becomes an urgent and practical matter in need of an answer. *Prof. Kopal* pointed out that the White House's policy statements regarding future missions to Moon do not use the word "exploitation", and refer only to "exploration" and "use" of resources on the Moon. According to him, it is important that one differentiate between "exploration" and "commercial exploitation" of outer space resources. *Prof. Larsen* reacted by stating that one recent NASA document refers to economic exploitation, which represents a more important goal than mere exploration of resources. Also, there is a policy statement made by Russian space authorities that makes reference to "economic exploitation" of outer space resources. It seems, therefore, that several States have concrete plans to undertake commercial exploration of outer space resources.

The third commentator was *Prof. Chia-jui Cheng* (Chairman, Asian Institute of International Air and Space Law, Taipei; Secretary-General of the Curatorium and President of Xiamen Academy of International Law), who expressed his intention to further provoke the audience with several other controversial topics regarding the legal issues of exploration and exploitation of outer space. First, in his view, the distinction between peaceful uses and military uses of outer space needs to be clarified by the United Nations. The issue is how do you determine that the purpose of a satellite, such as the ones in the Galileo constellation, is for peaceful purposes or for military uses. Therefore, according to Prof. Cheng, there is a need for a definition of what "exclusively for peaceful purposes" means within the Outer Space Treaty context. Otherwise, the rule of law in outer space is bound to be decided by the strongest economic power.

Second, the speaker pointed out the growing concerns regarding space commercial applications and the legal issues raised by privatization and commercialization of space activities. The law of space telecommunication is in place, but there are new issues still in need of legal response, such as space commercial contracts, space insurance, APS (services provided onboard aircraft), and issues raised by remote sensing, such as the need to provide for the equitable sharing of data obtained as a result of remote sensing.

Third, there are contractual issues regarding the choice of law and of applicable jurisdiction. The question is whether the principle of private international law according to which the law of the State with closest contacts is applicable in space law as well.

Fourth, the issue of intellectual property in space activities needs also to be addressed.

Fifth, the issue of extraterritoriality of national space laws which, in Prof. Cheng's view, represents a significant problem arising within the context of international space law. The US seems to apply its law outside its territory in regard to space technology in a manner that may precipitate conflicts. The question is whether the US is permitted to extend its jurisdiction, based on the nationality of technology, to nationals of other States. The United Nations should prohibit certain States to force other States to follow their laws by imposing sanctions. In the field of space activities, one should prefer to apply international law rather than national law.

With this comment, the floor was opened for questions.

Prof. Ram Jakhu made comments regarding the issues raised in the discussion paper. In light of current and future technology developments, one can anticipate that orbital flights carrying cargo and mail will likely become reality in the next 2 to 5 years. In this context, the issue of the boundary between air space and outer space will become essential for establishing the applicable legal regime. There will be, most likely, a need to reassess certain space treaties and perhaps amend some of them as well as the Chicago Convention (to address more adequately issues such as defining "aircraft", certification of pilots, safety standards). Another major issue is whether the International Civil Aviation Organization (ICAO) is the proper international organization to be entrusted the authority to set and implement safety standards for the hybrid vehicles.

Prof. Kopal reacted to Prof. Cheng's comments on extraterritoriality of national laws by pointing out that one needs to differentiate between personal and territorial jurisdiction. The former is reflected as a concept in Article VIII of the Outer Space Treaty which provides for the need that States exercise jurisdiction and control over their private actors involved in space activities, while the latter is connected to the sovereignty of a State.

On the question of suborbital flights*, Prof. Marchisio* mentioned a press conference by a representative of Virgin Galactic on how the legal issues of the space tourism are handled. Also, according to this representative, Virgin Galactic helps financing the development of new technology with the money collected from the first passengers in outer space. According to Prof. Marchisio, until 2008, the suborbital flights will mostly be air flights with only a few minutes passage through outer space. At the present and for the foreseeable future, such suborbital flights are not international; they take off from the US territory (i.e., New Mexico) and land on the US territory. There is of course the issue of insurance for liability to the passengers, but this is not yet an issue of international law. If a different scenario was to apply, such as a flight from one State to another, then the question of which international organization should be in charge to regulate such flights becomes valid. Actually, the issue of how suborbital flights should be dealt with was already raised in the ICAO Council and in the Legal Subcommittee of COPUOS. The latter considered the definition of vehicles that fly horizontally across the outer space (as opposed to vertically) and this is why States have difficulties in answering the questionnaire (referred to in the discussion paper). The Technical Subcommittee of COPUOS was asked to give more clarification about what aerospace means. Regarding the comments on extraterritoriality of laws applied by the US, Prof. Marchisio noted that there are many instances in which extraterritoriality was applied, but he agrees that this is a dangerous path.

Prof. Joanne Gabrynowicz mentioned a case in Nevada in which the court dismissed the case by arguing that there is no base in the US law for recognizing property rights in outer space. Also, the speaker mentioned a Bill in the US House of Representatives that attempts to amend the Commercial Space Launch Act and limits the liability of launching companies based on the argument that commercial human space flight industry is a new industry that needs to be encouraged. The concerns were raised in regard to the need to protect the interest of people on the ground and who did not assumed voluntarily any risks regarding that particular launch. The Bill was passed in the House despite these concerns.

Prof. Gabrynowicz agreed with Prof. Beckman regarding the risks of reopening the discussion over the OST regime and interpretation. Although there are many individual aspects that could have been regulated in a better fashion when adopted, such as for example in regard

to the non-appropriation principle, the truth is that such a provision could not have been adopted today. If the space treaties are opened again for discussion, the risk is that some States will withdraw completely from these treaties.

Prof. Larsen pointed out that currently there is a draft private law treaty, the UNIDROIT Space Protocol, that focuses on financing of space assets. This Protocol, according to Prof. Larsen, will be to the advantage of developing countries. Financing rates for developing countries are going down as a result of adopting a similar protocol in the field of aviation. Prof. Larsen anticipates the same trend in the field of space law if the Space Protocol is adopted.

Dr. Tuvayanond, the author of the discussion paper asked for the floor to express his view that the audience did not seem to consider the issue of delimitation between air space and outer space as an important aspect that needs an immediate answer.

A question translated from Thai asked what are the core principles governing the State obligation to control the activities of non-State actors. *Prof. Beckman* referred to Art. VI of the OST that obligates the States to exercise continuous supervision and control over its space actors.

Prof. Cheng clarified his statements regarding the extraterritoriality of laws and reacted to Prof. Kopal's comments on the differences between territorial and personal jurisdiction. He pointed out that he did not mean situations where personal jurisdiction would apply, but cases in which the US imposed its national laws on other States. This is why Australia and the EU signed an agreement to stop other States from imposing their national laws on other States. With these comments, Session 6 ended.

BIOGRAPHIES OF SPEAKERS

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Recent publications include:

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Elisabeth BACK IMPALLOMENI

Elisabeth Back Impallomeni is Professor of International Law and Organization at the University of Padua, Italy. She is also a Lawyer.

She is a Member of the IISL Board of Directors.

Prof. Back Impallomeni is also a Member of the ECSL Board (European Centre for Space Law), and a Member of the International Academy of Astronautics.

She is the author of numerous publications (international law and space law).

Debarupa BANERJEE

Ms. Banerjee is a final year student of B.A. B.L. (Hons.) at NALSAR University of Law, Hyderabad, India. She is highly active in the area of aerospace law and has several internships, research papers and conferences to her credit.

In May-June 2006, she worked with Antrix Corporation, Dept. of Space, Bangalore, on the research paper "The Legal Concerns Surrounding Geographic Information: Time for a Reality Check".

In 2005, during an internship under Prof. S. Bhatt (JNU, New Delhi) she researched on "Open skies" policy in the area of liberalization of civil aviation, studying the U.S.A. and Europe experiences and finally the Indian perspective.

Also in 2005, at the Indian Space Research Organization, Bangalore, she researched on "Intellectual Property Rights and Space Activities: A Comparative Survey of the Situation in the United States, Europe and India".

She has also worked with advocates, NGOs and variously served at the Law Commission of India and the State Human Rights Commission, Assam, India.

Ms. Banerjee presented a paper on "Commercialization v. Public Good: A Comparative Study of Remote Sensing Policy in the U.S. and India" at Space Exploration 2005- The First International Conference and Exposition on Science, Engineering and Habitation in Space, Albuquerque, USA, April, 2005.

She has also presented a paper on **"Intellectual Property Rights in Remote Sensing Activities: An Overview"** at the Conference on Emerging Trends in Air and Space Law, Hyderabad, October 2005, NALSAR University of Law.

Her paper, **"Space Commerce and Space Law: Making the Twain Meet"** has been presented at the 10th ASCE Aerospace Division Conference and the 2nd NASA/ARO/ASCE Workshop, League City/Houston, USA, March 2006.

Most recently, her paper, **"Global Spatial Data Infrastructure: Issues for Space Law and International Cooperation**" has been selected for presentation at the forthcoming 57th International Astronautical Congress organized by the International Astronautical Federation at Valencia, Spain, October, 2006.

She has publications in the areas of general legal literature and criminal law and has participated in an exhibition debate, View and Counterview- Student's Oration on the motion: *It is Legal to Claim Private Property Rights to the Moon and other Celestial Bodies or Parts thereof* in IISL Space Law Conference, June 2005, Bangalore, organized by Astronautical Society of India.
She also served as Editor, NALSAR Student Law Review (2004-2005).
She is presently heading an editorial team working to publish a book of selected conference papers (Conference on Emerging Trends in Air and Space Law, October 2005 organized by NALSAR University of law) under the guidance of Prof. S. Bhatt and Dr. V. Balakista Reddy.

Robert C. BECKMAN

Robert Beckman is an Associate Professor at the Faculty of Law of the National University of Singapore, where he has taught since 1977. He received his J.D. degree from the University of Wisconsin, Madison, and his LL.M. from Harvard Law School. He is a US citizen and a permanent resident of Singapore.

He served as the Vice-Dean (Academic Affairs) at the Faculty of Law from 1 May 2001 to 1st June 2006. The subjects he has taught or is currently teaching at NUS include Public International Law, International Legal Process, Ocean Law & Policy, Marine Environmental Law, International Regulation of Shipping, Space Law & Policy and Singapore Legal System. He has been coach and faculty advisor to the Singapore moot teams in the Philip C Jessup International Law Moot Court Competition since 1978 and his teams have won the Jessup Cup 4 times and placed runners-up 7 times. Beginning in 2000 he worked to expand the participation of NUS in other international mooting competitions. He has received two awards from the National University of Singapore - the Staff Achievement Award in 1997 and Outstanding Educator Award in 2001.

His special research interests are the law of the sea, including piracy and maritime terrorism, marine environmental law, international regulation of shipping and integrated coastal management. He is an advisor to the Maritime & Port Authority of Singapore (MPA) and to the Legal Committee of the Singapore Shipping Association (SSA). Professor Beckman currently represents Singapore on the CSCAP Study Group on Capacity Building for Maritime Cooperation in the Asia-Pacific. He is also of member of its Working Group of Legal Experts.

Prof Beckman's interest in space law originated with the IISL Space Law Conference held in Singapore in 2001. He coached the NUS teams in the Manfred Lachs Space Law Moot Court Competition from 2000 to 2003. His 2000 and 2001 teams won the Asia-Pacific Regional Round, and his 2001 team travelled to Toulouse to become the first team from the Asia Pacific region to win the World Finals. In 2003 he presented a paper in Korea at a Workshop on Space Law sponsored by the UN Office of Outer Space Affairs and the Republic of Korea.

Maria BUZDUGAN

Ms Buzdugan holds an LL.M. (Masters of Laws) from the Institute of Air and Space Law, McGill University, Montreal, Canada, February 2006, a Ph.D. in Public Administration from American University, School of Public Affairs, Washington, D.C., 2003, and an LL.M. (Master of Laws) from Washington College of Law, American University, Washington, D.C., 1997.

Since May 2006, she is a post-doctoral fellow at the Institute of Air and Space Law, McGill University, Montreal, and assisted in organizing the Interdisciplinary Workshop on Policy and Law relating to Outer Space Resources: The Example of the Moon, Mars and other Celestial Bodies, McGill University, June 2006. Jointly with Prof. Ram Jakhu, she presented a discussion paper on "The Role of Private Actors: Commercial Development of the Outer Space Resources, including Those of the Moon and Other Celestial Bodies: Economic and Legal Implications". She was also involved in collecting, editing and publishing the Workshop Proceedings.

In 2005 and 2006 she was rapporteur of the Space Security Index project, McGill Institute of Air and Space Law, and assisted in organizing the Working Group meeting of the Space Security Index project; she acted as rapporteur for two meetings and actively assisted in editing the 2004 Space Security Index report.

Since June 2004, she serves as editor of the Annals of Air and Space Law, published by the McGill Institute of Air and Space Law.

in 2004-2005 she was researcher for the Secure World Foundation, "Engaging Parliamentarians Project" at the Institute of Air and Space Law, McGill University, and also for The Canada Project, "Expanding Canadian Markets With Open Skies" at the Institute of Air and Space Law, McGill University.

Her publications include:

- "Air Cargo Security: A Critical Analysis of National and International Initiatives", Annals of Air and Space Law, vol. XXXI (2006) (pp. 133-166)
- "Current and Emerging Air Cargo Security and Facilitation Issues", TIACA Times [April 2006]
- "Air Cargo Security: Are We Doing Enough?", Annals of Air and Space Law, vol. XXXI [forthcoming May 2006]
- "The Evolution of Canadian Air Transport Policy", co-authored with Paul Dempsey and Yaw Nyampong, in McGill and Concordia' Report on International Aviation Policy for Canada (Montreal: McGill Centre for Research on Air & Space Law, 2005)
- "The Role of Public Participation in the Enforcement of Environmental Regulations", Eco-Notes, no. 3 (Spring 1997) at the American University, Washington College of Law

Ms. Buzdugan is a member of the Bars of New York, Maryland, Virginia and California.

Chia-Jui CHENG

Prof. Chia-jui Cheng is Professor of International Law, School of law, Soochow University, and Secretary-General of the Curatorium and President, Xiamen Academy of Int'l Law.

Professor Chia-Jui graduated from Soochow University School of Law in 1960. He spent the years 1961 to 1969 in Europe where he obtained his LL.M.s and Diplomas from Athens, Poitiers, London Leiden, and New York (Columbia) Universities. His LL.D. in International Law was granted by National Athens University in 1967.

Professor Cheng joined the diplomatic service in 1968. From then until 1977 he had a distinguished diplomatic career accredited to different international organizations and capitals in Europe. His first post was an appointment as Legal Specialist/Counsellor of the Treaty Department of the Ministry of Foreign Affairs, and his last post before joining the School of Law, Soochow University in 1977 was Representative of Ambassadorial Rank in Athens from 1972-77.

In 1991 he was elected as Dean, Graduate School of Law and School of Law, Soochow University, and served in that capacity until 1997. He has conducted research frequently at UC-Berkeley; UCLA, New York University, Columbia University, Harvard Law School and Yale Law School. Since 1990 in Europe he has kept close academic contacts with leading faculties of law in Greece, Italy, Switzerland, France, Germany, the Netherlands, the United Kingdom (Cambridge, London, and Oxford).

During 2001-2002 he was invited twice to be visiting professor, Faculty of Law, University of Marseille at Aix-en-Provence, France. He was also frequently appointed visiting professor at various universities in Mainland China. In 2003, he was named Rodger Young Visiting Scholar at the University of Hong Kong.

Currently, he is professor of international law at Soochow University School of Law and Visiting Professor of International Law on the Xiamen Univesity Faculty of Law. He holds various professorship titles at universities in Mainland China.

In 2005 he was elected Secretary-General of the Curatorium and President of the Xiamen Academy of International Law, Asia's newly established highest academic institution of international Law (similar to The Hague Academy of International Law)

He also holds many academic positions in the field of international law and comparative law, including Chairman, Asian Institute of International Air and Space Law; President, Chinese Association of Air Transport; President, Chinese Society of Comparative Law; Member, International Institute of Space Law at Paris; Member, International Academy of Comparative Law at Paris; and Member of International Law Association at London.

Many of his books and articles have been published in Chinese, mainly on topics of international law and comparative law. Occasionally, he has published in the Greek and French languages.

His mother tongue is Chinese, but he has mastered Greek, Latin, English and French. German, Italian, Japanese, Spanish, and Portuguese are also his working language.

Sethaporn CUSRIPITUCK

B.A (Hons., Chulalongkorn University), M.P.A (Hons., NIDA), M.A (University of Florida, USA); Commissioner, National Telecommunications Commission of Thailand; Professor in Journalism and Mass Communications, Thammasat University, Bangkok, Thailand; was a Director of Radio Frequency Management Division (1988-1990) and Director General of the Post and Telegraph Department (1997-2001); a member of the Thai Delegations to the 1994 ITU Plenipotentiary Conference, Kyoto, Japan, and the 1998 ITU Plenipotentiary Conference, Minneapolis, USA; the Head of Thai Delegations for the 1995 and 1997 World Radiocommunications Conferences (WRC), Geneva, Switzerland; the 1998-2001 ITU Councils, Geneva, Switzerland; the Head of Thai Delegations for Radio Frequency Coordination Meeting with Hong Kong, People's Republic of China, Japan, Indonesia, India, Tonga, Russian Federation and Malaysia.

Joanne GABRYNOWICZ

Prof. Gabrynowicz teaches international space law, U.S. space law, and remote sensing law. She is the Director of the National Remote Sensing and Space Law Center and the Editor-in-Chief of the Journal of Space Law.

Before joining the faculty in 2001, Prof. Gabrynowicz was a founding faculty member of the Space Studies Department at the University of North Dakota. Prior to beginning her academic career, Gabrynowicz was the managing attorney of a law firm in New York City. She has edited a number of books and authored numerous articles on space law, including an invited paper on remote sensing law at the Third U.N. Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III). Gabrynowicz is an official observer for the International Astronautical Federation to the Legal Subcommittee of the U.N. Committee on the Peaceful Uses of Outer Space. She is a delegate to the Group on Earth Observations and to the Unidroit Committee of Governmental Experts for the Preparation of a Draft Protocol to the Convention on International Interests in Mobile Equipment on Matters Specific to Space Assets. The U.N. Office of Outer Space Affairs asks Gabrynowicz to lecture on space law at its annual capacity building workshops for government officials and policymakers from developing nations. She briefed former U.S. Secretary of the Interior Gayle Norton as part of the Secretary's preparation to speak at the Earth Observation Summit. Gabrynowicz is the organizer and chair of the Federal Advisory Committee for the National Satellite Land Remote Sensing Data Archive and was a member of the Department of Commerce Advisory Committee on Commercial Remote Sensing. She advised the Eisenhower Institute on its study, *The Future of Space—the Next Strategic Frontier*, and served on the Congress of the United States Office of Technology Assessment Earth Observations Advisory Panel. She was a member of the National Research Council Committee that produced Bits of Power: Issues in Global Access to Scientific Data. Gabrynowicz was invited by the National Research Council to testify on licensing geographic data and services. She was invited to address the *Stepping Stones to the Future of Space Workshop on International Cooperation/Competition- Why, How, When?* and the NASA Public Health Applications Program on Confidentiality and Geospatial Data.

Gabrynowicz was awarded a NASA/American Society of Engineering Education Summer Faculty Fellowship from Goddard Space Flight Center where she served as the 1997 Dean of the NASA Space Academy. She was awarded the 2001 Women in Aerospace Outstanding International Award and was a Distinguished Speaker in the 2003-2004 Donahue Lecture Series of the Suffolk University Law Review.

She is a member of the American Bar Association Forum on Air and Space Law, the New York State Bar, the International Institute of Space Law and Women in Aerospace.

Atsuyo ITO

After receiving her BA in Japan, Ms. Ito studied at Leiden University in the Netherlands and obtained her LLM in International Air and Space Law.

Currently, she is working on her Ph D research at the University of Paris XI on legal aspects of remote senisng for disaster management and protection of the environment.

Ms. Ito received the Prof. Diederiks-Verschoor Award of the IISL at the International Astronautical Congress held in Vancouver, Canada in 2004.

She presented the discussion paper on Disaster Management at the regional space law conference organised by the Astronautical Society of India, ISRO and IISL in June 2005.

Ram JAKHU

Professor Ram Jakhu is presently an Associate Professor at the Institute of Air and Space Law, Faculty of Law, of McGill University in Montreal, where he teaches several courses covering numerous subjects including international and national space law and policy, international trade, export controls, space applications, space commercialization, telecommunication, etc.

From 1999 to 2004, he served as the Director of the Centre for the Study of Regulated Industries. Under a multi-million dollar project funded by the Canadian International Development Agency, Dr. Jakhu managed a five-year project and advised the Indian Institute of Management in Ahmedabad, India, in setting up a Centre for Telecom Policy Studies for the purpose of conducting research on issues such as privatization, deregulation and restructuring of the Indian telecom sector.

From January 1995 to December 1998, Dr. Jakhu served the International Space University (ISU), Strasbourg, France, holding various titles, including a Professor and the first Director of the Master of Space Studies program. At the ISU, he designed and managed a unique interdisciplinary, international and intercultural graduate level training program for all sorts of space professionals. He has served as a project manager for several international and interdisciplinary space-related studies.

Prof. Jakhu's research interests include law and policy of space applications, government (national) regulation of space activities, telecommunications, and space business. He has published a book and more than 50 articles in several reputed journals. He has presented numerous papers and expert legal opinions at various conferences around the world.

Prof. Jakhu is the founder and President of *Cyber & Space Telecom Inc.,* (www.spacetel.com) a Montreal-based consulting firm, specializing in space and telecom business, law and policy. The firm has undertaken over 25 consulting assignments for various governments, organizations and private companies from around the world.

He holds a Doctor of Civil Law (Dean's Honours List) degree in Space Law and Policy from McGill University; a Master of Law (LL.M.) degree in the field of Air and Space Law from McGill University. In addition, he has earned LL.M. (in Public and Private International Law), LL.B. (in Laws of India) and Bachelor of Arts (in Economics and Political Science) degrees from Punjab University, Chandigarh, India.

Vladimir KOPAL

Prof. Dr. Vladimir Kopal is professor of international law, West Bohemen University in Pilsen, Czech Republic.

Since 1962, as a delegate of his country, he participated in many sessions of the UN Committee on the Peaceful Uses of Outer Space (COPUOS) and its subcommittees, and during 1999-2004 he was Chairman of the COPUOS Legal Subcommittee. During 190s he served as Principal Officer of the United Nations, New York, and since 1993 through 1998 he was Chief of the UN Outer Space Affairs Division. He participated in all UN Outer Space Conferences (1968, 1982, 1999 and also in the UISPACE III + 5 in 2004).

Prior to his admission to the United Nations, he was Chief of the Department of International Law and Organisations in the Institute of Law of the Czechoslovak Academy of Sciences and Professor of Charles University of Prague. Prof. Kopal has been a Conciliator and Arbitrator under the UN Convention on the Law of the Sea. He has also held different positions in NGOs, e.g. General Counsel of the International Astronautical Federation (IAF) and Vice-President of the International Institute of Space Law (IISL). He has been member of several international and foreign societies dealing with space matters (e.g. Member, International Academy of Astronautics; Fellow, American Institute of Aeronautics and Astronautics, Membre associé étranger, Académie de l'air et de l'espace, France; Honorary Member, Deutsche Gesellschaft für Luft- und Raumfahrt). He lectured on general international law and international organisations, space law and the law of the sea at several foreign universities, many conferences and other institutions.

He has been author of more than 250 monographic studies and other papers in the field.

Toshio KOSUGE

Toshio Kosuge is Professor Emeritus of the University of Electro-Communications, Tokyo, Japan

He is also Professor at Digitalhollywood University, Tokyo, Japan.

Prof Kosuge is a Member of the Board of Directors of the IISL, and Chairman of the Society for Study of Law and Policy on Space Utilization.

He is a Member of the Research Committee on Telecommunications of the Japanese Ministry of Internal Affairs and Communications, a Council Member of the Japan ITU Association, Japan Association of Telecommunication and Communication Cooperation, and the Board of Directors of the Association for Basic Human Needs in Telecommunications.

Paul B. LARSEN

Prof. Larsen teaches space law and aviation law at Georgetown University Law Center in Washington DC, USA.

He is the author of Aviation Law: Cases, Laws and Related Sources (with Sweeney and Gillick) and editor of Space Law (with Lyall). In addition to these books he has published many articles on space law and aviation law subjects. He serves on the advisory board of the Journal of Air Law and Commerce. He and Professor Lyall are at work on a treatise on space law to be published in 2008.

Prof. Larsen is a frequent contributor to the IISL Colloquia on the Law of Outer Space.

Peter MALANCZUK

Dean & Chair Professor, School of Law, City University of Hong Kong

Education:

1968-73	Studies at the Universities of Göttingen, München and Heidelberg,
1973-76	Legal training in courts, government and law firms, Heidelberg
1983	Doctor of Law (*summa cum laude*), University of Giessen, Germany

Professional career:

1976-78	Assistant at the Faculty of Law, University of Giessen, Germany
1978-81	Lecturer at the Faculty of Law, University of Exeter, England
1981-86	Research Fellow, Max-Planck-Institute of Comparative Public Law and International Law, Heidelberg
1986-89	Legal Assistant of the President, Iran-United States Claims Tribunal, The Hague (claims arising from the Islamic Revolution 1979 in Iran)
1990-97	Professor of International Law, University of Amsterdam; Head of Department
1992	Visiting Professor at Michigan Law School and University of California at Berkeley (Boalt Hall Law School)
1994	Visiting Professor at Moscow State (Lomonosov) University
1997-01	Professor of International Law, Erasmus University Rotterdam; Head of Department; founding Director of the GLODIS-Institute (Institute of Globalization, International Economic Law and Dispute Settlement); Director of the LLM in International Law
1997	Honorary Professor, Nankai University, China
1998	Honorary Professor, China University of Politics and Law, Beijing
1999	Honorary Professor, Peking University
2001	Distinguished Visiting Professor, University of Hong Kong
2001-02	Visiting Professor, School of Law, City University of Hong Kong
Since 2002	Professor (Chair) of Law, City University of Hong Kong; founding Director, WTO Law & Dispute Resolution (WTODR) Centre; Programme Leader, MA in Arbitration and Dispute Resolution
2003	Honorary Professor of Shenzhen University, China
Since 2004	Dean, School of Law, City University of Hong Kong
2005	Honorary Professor, Nanjing University, China

Publications:

Author of numerous publications on general international law, international economic and trade law, state responsibility, international arbitration and dispute settlement, environmental law, human rights, international criminal law, telecommunications and space law, European Community law, and comparative law. Advisory boards of various international legal journals (see list of publications).

Guest-lectures: At many universities in Europe, North America, Asia and Africa

Listed in *Marquis Who's Who in the World* and in *The European Legal 500*.

V. S. MANI

Professor Dr. V. S. Mani (Venkateswara Subramanian Mani), M. A., LL. B., Ph.D, is Director, Gujarat National Law University, Gandhinagar-382 028 Gujarat, India.

Prof. Mani taught and researched in most branches of international law for the past more than 35 years. He was Professor of International Space Law, Jawaharlal Nehru University (JNU) from 1990-2004, Professor-in-Charge, Jawaharlal Nehru Chair in International Environmental Law JNU, 1999-2004, and Director, Human Rights Teaching & Research, SIS, JNU, 1993-2004.
He served as Executive President (2003-2006), and Secretary-General (1997-2000) of the Indian Society of International Law, New Delhi.

In 2003 he was a Visiting Fellow at Max Planck Institute for Comparative Public Law and International Law, Heidelberg, Germany. He was Visiting Professor, International Centre for Comparative Law & Politics, University of Tokyo, in 2000, & West Bengal National University of Juridical Sciences, Kolkata, India in 2002.

He gave Professorial lectures at The Hague Academy of International Law on 'Humanitarian' Intervention Today in August 2005. He chaired a session and made a presentation at UNISPACE III Vienna, 1999 and was a member of the Steering Committee of the Technical Forum to draft the Space Law recommendations for UNISPACE III Vienna Declaration 1999.
Prof. Mani is the Editor (2003-) of the India Journal of International Law, Member of Editorial Board, International Review of the Red Cross (Geneva) and Singapore Yearbook of International and Comparative Law (Singapore).

During his extensive professional/government experience, Prof. Mani was Agent & Legal Counsel for the Republic of Nauru before the ICJ in the case concerning Certain Phosphate Lands in Nauru (Nauru v. Australia) 1989-93 until settlement of case 1993, Legal Counsel & Expert Consultant for India in the case concerning the Aerial Incident of 10 August 1999 (Pakistan v. India) 1999-2000, Associated in preparation of India's Written Pleadings in the case concerning Jurisdiction of ICAO Council (India v. Pakistan) before ICJ, Associated in preparation of Nauru's Written Pleadings in Advisory Proceedings before ICJ on Legality of the Threat or Use of Nuclear Weapons (ICJ Opinion 1966).

He was Chief Secretary, Secretary to the Cabinet & Public Service Commissioner, Rep. of Nauru, 85-90, simultaneously Secretary for External Affairs (86-89), Secretary for Civil Aviation & Telecommunications (1987-89), Acted as Secretary for Justice (Attorney-General), Rep. of Nauru (82-83), Republic Counsel, Rep. of Nauru (81-83).

Prof. Mani is Fellow, Indian Council of Arbitration, Life Member, Indian Society of International Law & Indian Law Institute, IISL, India International Centre, Founder Trustee, Institute for the World Congress of Human Rights, New Delhi, Board of Advisors, Weeramantry Int'l Centre for Peace, Education and Research, Colombo. He has authored/edited 9 books and over 100 articles (excluding a large number of Newspaper Edit page articles.

Sergio MARCHISIO

Prof. Marchisio is a Full Professor of Law of International Organizations at the University La Sapienza of Rome, in charge with the course of Air and Space Law at the same University.

He serves as Secretary General of the Italian Society of International Law, and is Director of the Institute for International Legal Studies of the Italian National Research Council (CNR).

He was the Chairman of the Legal Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS) (Vienna, 2004-2005).

Prof. Marchisio is Vice-Chairman of the European Centre for Space Law (ECSL/ESA, Paris); corresponding Member of the International Academy of Astronautics; Member of the International Institute of Space Law (IISL); and Member of the Board of Directors of the Italian Centre for Space Law.

He serves as Legal Counsel of the Italian Ministry of Foreign Affairs, in particular for Space Law matters. He acted as representative of the Italian government in a number of international conferences and negotiations; since 1997 he is Italian Delegate to the Legal Subcommittee of the UNCOPUOS.

He chaired the UNIDROIT Committee of governmental experts for the Preparation of a draft Protocol to the Convention on International Interests in Mobile Equipment on Matters specific to Space Assets" (2003-2204), and published more than 20 monographs and books, and 93 essays and articles on different International law, European Union law and Space Law topics.

Tanja MASSON-ZWAAN

Tanja Masson-Zwaan is Executive Secretary of the International Institute of Space Law.

She holds a Masters degree in public international law of Leiden University, The Netherlands. She specialised in air and space law and was Co-Director of the International Institute of Air and Space Law (IIASL) at Leiden University from 1985-1990, where she still serves as Liaison Officer.

In 1990 she moved to Paris and was elected Secretary of the International Institute of Space Law (IISL), a position to which she has since been re-elected every three years. She also served as Board Member of the European Centre for Space Law (ECSL) established by the European Space Agency (ESA) and was Executive Secretary of the Ariane Liaison Committee managing the image of the Ariane launcher for Arianespace, CNES and ESA.

Tanja moved to Singapore in 1996, where she joined the Law Faculty of the National University of Singapore as Adjunct Senior Fellow and set up and taught two new graduate courses in air law and space law.

She joined the aerospace insurance and consulting company Aon Explorer in France in 2003, working as a Senior Consultant for several industrial and institutional clients in the field of air and space law, particularly satellite navigation.

Having moved back to The Netherlands in 2004, Tanja created Adastra Consulting and works as an independent consultant on various projects, such as updating the civil aviation legislation of new EU Member States. She also continues to work with Aon Explorer in the field of EU funded Galileo projects. She spends a good part of her time on her work as Secretary of the IISL, for which she organises annual Colloquia, regional space law conferences (Singapore, Beijing, Bangalore, Bangkok), the annual Manfred Lachs Space Law Moot Court Competition, and a range of other activities promoting knowledge of space law and interaction between space lawyers worldwide.

KR Sridhara MURTHI

Mr. Murthi is currently Executive Director of Antrix Corporation, which is commercial arm of Department of Space. He has over 30 years of experience in Indian Space Programme. Prior to his current assignment he was the Scientific Secretary of Indian Space Research Organisation, in which capacity, he had been responsible for overall direction and guidance for international cooperation, budget and human resources development, space policy and public outreach of Indian Space Program.

Joining the Indian Space Research Organisation in 1975, Mr. Murthi handled a variety of responsibilities in satellite programme planning at ISRO Satellite Centre until 1985 and guided technology transfer and industry cooperation programme at ISRO Headquarters during 1986-1990. He was Counsellor (Space) at Embassy of India in Paris during 1990-94 promoting cooperation between ISRO and European Organisations. Mr. Murthi holds a degree in Mechanical Engineering with post-graduate qualification in Business Administration from Indian Institute of Management, Ahmedabad.

He was elected as Vice President of International Astronautical Federation during 1998-2002, responsible for external relations with international organizations. He had been Indian delegate to United Nations Committee on Peaceful Uses of Outer Space. He is a member of the Board of directors of International Institute of Space Law (IISL), and a Trustee of International Academy of Astronautics (IAA). He has been the recipient of 2003 Social Sciences Award of International Academy of Astronautics.

He has several publications in national and international journals and co-author of the book "Perspectives in Communications" published by World Scientific Publishing Company, Singapore.

R.M.R.B. NAWINNE

Mr. Nawinne has been employed at the Attorney General's Department of Sri Lanka since June 1992, and was promoted to the post of Senior State Counsel in 2005. He was a Private Legal Practitioner from 1990-1992.

He passed the Attorney's at Law (Preliminary) Examination in 1987, Attorney's at Law (Intermediate) Examination in 1988 and the Attorney's at Law (Final) Examination in 1989. Mr. Nawinne was enrolled as an Attorney at Law of the Supreme Court of Sri Lanka on 1st November 1990, and was awarded LLM (Hons) in Air and Space Law by the Leiden University, the Netherlands in 2003.

He represented the Government of Sri Lanka as representative of the Attorney General in bilateral negotiations relating to air service between Sri Lanka and other Countries (over 20), and has been nominated to serve in the Permanent Committee to examine the designation of local (in Sri Lanka) airlines for operation of International Commercial Passenger Flights.

He participated in the following Study Programs:

- Seminar organized by Airlanka Ltd and the Department of Civil Aviation Sri Lanka in collaboration with Mc Gill University, Montreal, on `Air Transport in Asia, Legal and Regulatory Challenges', 1994
- Summer Session (Private International Law) held in the Hague Academy of International Law from 7th to 25th July 1997.
- Commercial Law Training Programme, National University of Singapore 1999.
- Workshop `Towards a New Regime in Airline Liability', February 1999, Dept. of Civil Aviation of Sri Lanka with ICAO and Airlanka.
- WIPO Interregional Seminar on Copyright and Related Rights, Geneva, 2000 and Training Course on Copyright and Related Rights, Helsinki, 2000.
- UN/IIASL workshop on "Capacity Building in Space Law", the Hague, 2002.
- New Avenues Through European Skies" Conference, International Institute of Air and Space Law, University of Leiden, 2003.
- "Aviation and Space; Emerging Legal Developments in the 21st Century", Department of Civil Aviation, Dubai with the Asia Pacific Alumni Association of the Institute of Air and Space Law, Mc. Gill, Montreal, Dubai, 2003
- "IIASL, 20th Anniversary Conference: A competitive aerospace environment: Is globalization the answer?", The Hague, 2006.

Papers, Presentations and Publications:

- National Implementation of Space Treaties: Sri Lanka, Leiden Univ., 2002.
- European Community Law and Policy in Air Transport: External Relations and Bilateral Air Transport Agreements with Third Countries, Leiden Univ, 2003.
- EC Law and Policy in Air Transport, Aviation Training Centre, Civil Aviation Authority of Sri Lanka, 2004
- Bilateral and Multilateral Air service agreements, Attorney General's Dept, 2004

Professor Sang-Myon RHEE

Prof. Rhee has been teaching jurisprudence, Anglo-American law, international law, aerospace law, since he joined the College of Law, Seoul National University in 1982. Previously he worked briefly at the Korean Foreign Ministry, before he went to Cambridge, Massachusetts in the U.S. to attend the Harvard Law School where he earned an SJD degree under Professor Louis B. Sohn. His mentors included Professors Richard R. Baxter, Roger Fisher and Jerome Cohen. Professor Leo Gross at Fletcher School of Law and Diplomacy once suggested him to receive his chair, when Prof. Rhee published articles in the American Journal of International Law with working experiences at Chadbourne Park, a New York City Law Firm and with the Legal Advisor's Office at the U.S. State Department. However, he chose to return to alma mater Seoul National University due to the advice of his former teacher Prof. Han Key Lee, who gave his chair to him, after assuming the position of Prime Minister of Korea.

Prof. Rhee have written hundreds of scholarly articles, essays, columns. dealing with various legal issues. His opinions have been influential at home and abroad, having sometimes been highlighted at the top of the front pages of the leading dailies. He was former President of Korean Society of International Law. He has been on the board of editors of several Law Reviews and Journals. He has been members of the various scholarly and practical organizations, including American Society of International Law, International Institute of Space Law, International Commission on Large Dams. He has had practical working experiences in areas of trade, environment, energy law, law of the sea, aerospace law, etc.

In spite of his scholarly and practical achievements, perhaps he is better known in Korea as writer and poet. He traveled more than fifty countries in all continents except Antarctica to participate in international conferences. He speaks several foreign languages. He once taught at the University of Washington in Seattle. He often gives lectures in local languages in China and Japan.

Ida Bagus Rahmadi SUPANCANA

Mr. Supancana is Chairman/Founder of the Center for Regulatory Research.

He holds a Doctor's Degree in International Law, University of Leiden, The Netherlands, 1998; He provides legal consultancy services with specialization in the field of investment law, international business transaction, ICT law, air and space law, corporate law, etc;

He conducts strategic and policy research for some governmental institutions such as: The Indonesian Legal Development Body (BPHN), Ministry of Justice and Human Rights; National Aeronautic and Space Agency (LAPAN); Department of Transportation Republic of Indonesia; Indonesian Air Force; Advising the Government of the Republic of Indonesia on Space Cooperation Agreement with Russia and Ukraina (Ministry of Foreign Affairs, 2006).

He lectures for post graduate and under graduate studies at several state and private university in Jakarta, Surabaya and Denpasar (Bali), including Air Space Staff and Command School on several subjects: Public International law, International Economic Law, International Business Transaction, Investment Law, ICT Law, Air and Space Law, Corporate Law.

Mr. Supancana served as Higher Education Consultant, World Bank Office, Jakarta (2004–2005); and has been a Lecturer on International Contractual Law, International Trade Law, Foreign Direct Investment Law, International Economic Law, Air and Space Law and Cyber Law for Post Graduate Study at several State and Private Universities in Jakarta, Surabaya and Denpasar since 1984. He has been Legal Advisor and Resource Person at National Aeronautic and Space Agency (LAPAN) since 1984, and is Chairman/Member of several Interdepartmental Working Groups at the Indonesian Legal Development Agency, Department of Justice and Human Rights (BPHN).

Mr. Supancana is a member of the following professional associations:

- International Institute of Space Law (IISL) of the International Astronautical Federation (IAF);
- Indonesian Satellite Association (ASSI);
- Indonesian Infocom Society (Mastel);
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Dr. Yun ZHAO

Dr Zhao studied at China University of Political Science and law in Beijing (LL.M. in 1998 and LL.B. in 1995), Leiden University, the Netherlands (LL.M. in 1999) and Erasmus University Rotterdam, the Netherlands (Ph.D. in 2003).

He is Assistant Professor and LL.M (fast-track mode) Program Leader at the School of Law of City University of Hong Kong.

He is also founding Council Member of Hong Kong Internet Forum (HKIF), elected Member of the International Institute of Space Law at Paris, and Member of the Asia Pacific Law Association.

Previously, he was researcher at GLODIS Institute, Erasmus University Rotterdam, the Netherlands (2000-2002).

He is the first winner of the Isa Diederiks-Verschoor Prize in the Netherlands and also the first winner of SATA Prize by the Foundation of Development of International Law in Asia (DILA).

He has issued more than 70 publications on various topics including Dispute Resolution, Air & Space Law (including Telecommunications Law), E-Commerce Law, International Economic Law. His recent publication include *Dispute Resolution in Electronic Commerce* (Martinus Nijhoff, 2005), and *Liberalization of Electronic Commerce and Law* (Peking University Press, 2005).

CONFERENCE PICTURES


SPACE LAW CONFERENCE 2006
BANGKOK THAILAND
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Institute and Centre for Research of Air and Space Law

Faculty of Law, McGill University

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